

PAGURID CRABS OF THE WESTERN NORTH
ATLANTIC SOUTH OF CAPE HATTERAS

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PREFACE

The hermit crabs of the Caribbean Sea and its adjoining waters constitute a homogenous faunal group. Most of the species range widely through the region between Cape Hatteras, N. C., and the mouth of the Amazon River, with only a few found beyond these limits. While a majority of these species are found in the Gulf of Mexico, the region originally chosen for this study, additional information indicated that a study of the area from Cape Hatteras to South America would be of greater value. This was particularly true in the light of important collections made on the south Atlantic coast of the United States, in the deep water around Cuba, and off the northeastern coast of South America.

The objectives of this study are to report on new species and to review those previously described from the area. Additional data on distribution is given for most species and more complete descriptions than were previously available are provided for several others. Existing descriptions are scattered through numerous publications, many not readily accessible. The only keys to species from the area are for a few small groups. Prerequisite to proper placement of each species is a knowledge of all described genera. Since no complete key to these is available, and in

view of the large number present in the Caribbean, it seemed desirable to include such keys here.

A large share of the credit for the success of this undertaking must go to those who collected the specimens over the past century. I am particularly indebted to Mr. Harvey R. Bullis, Jr., Chief, Gulf Fisheries Exploration and Gear Research, Fish and Wildlife Service, who supplied the largest amount of material. To all who sent material directly to me, whose names are listed in the section on material studied, and to those whose names appear in connection with the various species, I am most grateful.

Dr. Fenner A. Chace, Jr., Curator, Division of Marine Invertebrates, U. S. National Museum, is deserving of special recognition for his encouragement, patience and careful attention to all my requests over the past several years. Dr. Chace arranged for an extended period of study at the National Museum and gave freely of his time during this period. I am also appreciative of the assistance given by Dr. Elisabeth Deichmann, Curator of Marine Invertebrates, Museum of Comparative Zoology, in arranging for a short stay there and for loaning much valuable material.

Dr. E. Lowe Pierce, Chairman of my supervisory committee, has provided assistance and stimulation throughout the entire course of this work. The remaining members of the committee, Drs. R. M. DeWitt, E. S. Ford, E. R. Jones, and J. R. Redmond have provided many helpful suggestions in

the writing of the dissertation.

Dr. Harold J. Humm of Duke University introduced me to the study of marine life and has given frequent encouragement to my studies.

I am indebted to my wife who has typed all of this material at least twice and has been a continuous help in many other ways.

HISTORICAL REVIEW

The first records of hermit crabs in the literature of the Caribbean were Catesby's (1743) descriptions of Cancer maximus bahamensis and Cancellus terrestris bahamensis. Of the latter, the only terrestrial pagurid in the West Indies, Catesby wrote, "They being roasted in their shells are esteemed delicious." These two species, now known respectively as Petrochirus bahamensis and Coenobita clyneatus, are the largest hermit crabs in the western Atlantic. Although Catesby's pre-Linnaean descriptions were republished by George Edwards (1771), it is the names of Herbst (1791) which are accepted for these species as well as for two others, Calcinus tibicen and Clibanarius scolopetarius, from the same region.

Clibanarius vittatus (Bosc, 1802), a common intertidal species of southeastern United States and the mainland coast to Brazil, was the next pagurid described. Thomas Say (1817) became the first American to name a hermit crab when he described Pagurus longicarpus and P. pollicaris, both of which are abundant along most of the southern and eastern coasts of the United States. Rafinesque's description of P. longicarpus as P. truncatulus preceded that of Say by one month but, along with most of Rafinesque's work, was subsequently ignored. The name truncatulus has recently been suppressed

(Holthuis, 1954).

H. Milne Edwards described several species of pagurids from various parts of the world. Dardanus venosus (H. Milne Edwards, 1848) is the only name he proposed which is now used for a Caribbean species. With the description of Glibanarius tricolor (Gibbes, 1850) and G. brasiliensis Dana (1852) all of the littoral species of this genus in the western Atlantic became known, although numerous synonyms were to follow.

William Stimpson began his work in carcinology at a time when material from depths just below the intertidal zone was beginning to appear in collections. He described six species of pagurids from the western Atlantic, three of which were only recently rediscovered. His descriptions, while not usually supplemented by figures, were written with such accuracy that his species are not difficult to recognize. This is fortunate since most of his type specimens are said to have been destroyed in the Chicago fire (Chace, personal communication). After Stimpson's work in the late 1850's no further valid descriptions of hermit crabs from the western Atlantic were made until Sidney I. Smith (1879) described the widely ranging, deep-sea species Parapagurus pilosimanus. This was the first pagurid from the western Atlantic to be described from sublittoral depths. Its description was followed by preliminary descriptions of several species from the "Blake" collections by Alphonse Milne Edwards and of a

few others by Smith. The preliminary work by Milne Edwards was brought to completion when he collaborated with Bouvier (1893) in further study of the "Blake" material to produce the most outstanding work on pagurids ever done for the western Atlantic. This report contained complete descriptions and excellent figures for the 39 species included.

Strangely, only one of the species described by Milne Edwards and Bouvier (1893) became a synonym of one of the 37 species of pagurids described from both sides of the Americas by Benedict (1892). The preliminary descriptions in Benedict's paper were never supplemented by figures or further description. His material was obtained mainly from the dredgings of the "Albatross". He later described several species of Paguristes and a few species in other genera. These were seemingly done with less care than he used in his study of other anomurans.

At the turn of the century well over half of the species now known from the Caribbean area had been described. Deep-water species have been ignored since then except for the description of Pylonagurus cavimanus Chace (1939). The several other species described during this period have all been intertidal forms. The famous American carcinologist, Mary Rathbun, described a single pagurid from the western Atlantic, the unusual Clibanarius verrilli from Bermuda, a species which lives in calcareous tubes of annelids and actually belongs in the genus Calcinus. E. L. Bouvier (1918) described three small

species from Cuba; one of the names he proposed has been added to the long list of synonyms in the genus Clibanarius. Waldo L. Schmitt described two species in the 1930's. Forest (1954) described an unusual Paguristes from Martinique from a male specimen. This species may belong in another genus since it has only 11 pairs of gills. Another Paguristes described by Wass (1956) has been placed in a new genus.

MATERIAL STUDIED

A large share of credit for the success of this study must go to the fisheries research vessels of the U. S. Fish and Wildlife Service. No less than 39 species were taken by the "Oregon," "Combat," and "Silver Bay." Several of these species were new and most of the remainder were poorly represented in collections. The "Oregon" in its several years of operation has contributed a wealth of material to the National Museum. Through the courtesy of Dr. Fenner A. Chace, Jr., Curator of Marine Invertebrates of that institution, I was able to examine pertinent portions of their collections. Even more specimens were sent directly to me by Mr. Harvey R. Bullis, Jr., Chief, Gulf Fisheries Exploration and Gear Research, Fish and Wildlife Service, Pascagoula, Mississippi. Most of these collections were made in the Gulf of Mexico, off the eastern coast of Florida, and off the northeastern coast of South America.

The U. S. National Museum has a large amount of pagurid crab material, much of which awaited identification. In this category were the large collections made at the Dry Tortugas by Dr. Waldo L. Schmitt and other investigators, which contained type material for four new species. The collections by the "Pelican" in 1939 and 1940 along the north and east coasts of the Gulf of Mexico and the Atlantic coast south of

Cape Hatteras were a source of many new records.

The Museum of Comparative Zoology at Harvard contains the type specimens of nearly all the species described by A. Milne Edwards and E. L. Bouvier in their studies on the "Blake" material. The M. C. Z. also houses the excellent collection of deep-water pagurids from the "Atlantis" Harvard-Havana Expedition of 1938 and 1939.

Among individuals who contributed important amounts of material were the following: Dr. E. Lowe Pierce, specimens from Key West, Fla.; Dr. Willis G. Hewatt, material from the Texas banks; Dr. George D. Grice, Jr., several specimens from northwest Florida; Dr. Neil C. Hulings, specimens from the latter area of a species not taken in almost 90 years; Mr. Doyle Folks, many perfect specimens from Seahorse Key, Fla.; Mr. Frederick M. Berry, a large collection of Pagurus politus from the east coast of Florida; Dr. John M. Teal, specimens of Pagurus pollicaris and P. annulipes from Sapelo Island, Ga.; Dr. Charles Goodwin, specimens from the Institute of Marine Science at Aransas Pass, Texas; Mr. Robert Christiansen, a large number of Clibanarius from Palm Beach Co., Fla.; Mr. Jorge R. Lopez, about 150 specimens from Mayaguez, Puerto Rico. A two day cruise on the Texas A. and M. research vessel "A. A. Jakkula" provided material in which seven species were found.

TAXONOMIC CHARACTERS

Explanation of Procedure

An attempt has been made to keep descriptive terminology simple, consistent and as concise as possible. The external structures used in descriptions are treated in the same sequence for each species. More attention is given to those structures which best separate the species.

The paper of Forest (1954a) was a significant factor in the decision to make figures diagnostic of important structures. In the interest of brevity telegraphic style is used throughout the descriptions.

The list of synonyms for each species is restricted to the different names used and their authors and to references which were not included by Alcock (1905) or in the more complete bibliography of Gordan (1956). Several species previously considered valid are placed in synonymy.

Descriptions derived from the specimens examined are provided for those genera which contained more than one species. Ceratopagurus Yokoya is included although its description is too brief to allow its validity to be ascertained. Galaragurus and Nymbagurus of Boone (1932) are omitted. They may possibly be valid but this cannot be determined by the descriptions given. Cheironplatea is considered synonymous with

Pylochaetes, likewise Holopagurus with Isocheles.

Diagnoses adapted from earlier descriptions are given for species which were not seen or were not examined in detail.

The color guide of Maerz and Paul (1950) was frequently resorted to in making color notes but more common names were usually used since it seems unlikely that such a manual will be readily available to those who use this work.

Explanation of Measurements

All measurements are in millimeters and refer to length unless otherwise stated. The width of the shield is taken at its widest point. The third right pereopod was chosen as a representative of the walking legs since those on the right are usually longer than those on the left and the third pereopod is more accessible than the second. Measurements of the segments of this leg were made on the dorsal side.

GLOSSARY

- Acicle. Elongated scale stemming from second segment of antennal peduncle.
- Acuminate. Terminating in a point.
- Antennae. Jointed outer appendage on head.
- Antennules. Jointed medial appendages on head.
- Anterolateral angles. Angles of shield located anterior and lateral to center of shield.
- Approximated. Placed close together at the midline.
- Arthrobranch. A gill in the median row of the three rows of gills.
- Basis-ischium. More or less combined second and third segments of a pereopod.
- Biseriate. In two rows.
- Branchiae. Gills in pairs numbering from eight to 14.
- Carapace. More or less calcified covering of cephalothorax.
- Callosities. Friction pads on ventral part of thorax.
- Cardiac plate. More or less narrow median strip of carapace behind shield.
- Chela. Pinching claw at terminus of a pereopod.
- Cheliped. One of anterior pair of pereopods.
- Chitinous. Hardened integument not impregnated with calcium.
- Cornea. Area at tip of eye; darkly pigmented except in a few deep-sea species.
- Corneous. Composed of horny, translucent material.
- Coxa. First segment of pereopod.
- Crenulate. Margin presenting a wavy appearance.

Dactyl. Terminal segment of a pereopod.

Dentate. With teeth.

Denticulate. With small teeth.

Distodorsal, distoventral. Parts of a segment most distant from the body proper.

Equaling. Equal in length or reaching same distance from body.

Eyes. Refers to both cornea and eyestalk.

Flagellum. Terminal feeler of antennule or antenna.

Gonopods. Paired anterior pleopods which may or may not be functional in transmission of sex products.

Lamellae. Individual plates of a gill.

Lateral teeth. Anterior projections of shield on either side of rostrum.

Littoral. Used here to refer to zone of rooted vegetation.

Major chela. Largest pinching claw.

Maxillipeds. One of last three pairs of mouth parts.

Merus. Fourth segment of a pereopod.

Minor chela. Smaller pinching claw.

Monotypic. Only one species in a genus.

Operculiform. Shaped so as to close an aperture.

Operculum. Part or combination of parts used to form a door for an aperture.

Ophthalmic ring. Median structure between bases of eyestalks.

Penultimate. Next to last.

Pereopods. Last five pairs of thoracic appendages.

Phyllobranchiate. Gill lamellae leaf-like.

Pilose. Hair which is very fine.

- Pleopods. Abdominal appendages anterior to uropods.
- Pleurobranch. Gill from innermost of three rows.
- Plumose. Hair which is fine and feather-like.
- Podebranch. Gill from outermost of three rows.
- Pollex. Thumb formed by prolongation of propodus.
- Postcervical. Located posterior to shield.
- Pronodus. Penultimate segment of a pereopod.
- Punctate. Surface presenting small rounded depressions.
- Rami. Terminal segments of unpaired pleopods.
- Rasp. Patch or row of scales.
- Rostrum. Median anterior projection of shield.
- Setae. Here used to refer to all hairs or bristles.
- Spinules. Sharp projections not large enough to be considered spines.
- Sternum. Ventral portion of a thoracic somite.
- Styliform. Narrowed distally.
- Subapical. Ventral to apex.
- Subequal. Nearly equal.
- Subsymmetrical. Nearly symmetrical.
- Sulcus. Groove or depression.
- Telson. Posterior unpaired appendage of abdomen.
- Tuberculate. Covered with small projections lacking spines.
- Uniseriate. Composed of one row.
- Uropods. Paired posterior appendages of abdomen.
- Walking legs. Second and third pair of pereopods.

SYSTEMATIC ACCOUNT

Key to Families

The classification of MacDonald, et al, 1957, is used here. However, only the four families involved in this study are included in the key.

1. External maxillipeds approximated at bases. Superfamily Coenobitoidea.....2.
External maxillipeds widely separated at bases.
Superfamily Paguroidea.....Paguridae.
2. Body and appendages symmetrical, except for variation in telson of Mixtopagurus. Abdominal terga calcified and contiguous.....Pylochelidae.
Paired appendages never present on all abdominal segments. Abdomen membranous, terga never calcified..3.
3. Antennular flagellum ending bluntly.....Coenobitidae.
Antennular flagellum ending in a filament.....Diogenidae.

Family Coenobitidae Latreille

Genus Coenobita Latreille

Coenobita clypeatus (Herbst)

Cancer diogenes Catesby, (1743) 1771, p. 33, pl. 33.

Cancer clypeatus Herbst, 1791, p. 22, pl. 23, fig. 2A, B.

Pagurus clypeatus Fabricius, 1798, p. 413.

Coenobita diogenes Latreille, 1825, p. 277.

Coenobita clypeatus Hilgendorf, 1869, p. 98. --Monod, 1939, p. 560. --Chace, 1956, p. 153.

REMARKS: Gordan, 1956, p. 311, placed C. diogenes in synonymy with clypeatus. However, in doing so she also included the references since Alcock (1905) to a species from Malaysia which has been confused with the West Indian species because of Herbst's original designation of his species as having come from the East Indies (Schmitt, 1935). Most of Miss Gordan's references apply to the Oriental species which is properly known as C. hilgendorffi Terao. Those which apply to C. clypeatus Herbst are Rathbun (1919), Schmitt (1924 a and b), Pearse (1932), Boone (1935) and Schmitt (1935).

MATERIAL EXAMINED: Two hundred and seventy-five specimens from nine localities.

The USNM has a large number of specimens of this species, only a few of which, plus some from other sources, are listed below.

Florida: Near Lake Kissimmee, Fla.; A. M. Reese; 1 juv. male. Jupiter Id., $4\frac{1}{2}$ mi. north of Jupiter Inlet, Aug. 6, 1957; R. Christensen; 2 males. Sand Key, 7 mi. southwest of Key West, July 23, 1957; E. L. Pierce; 2 males taken alive lived until Dec. 11 when they died from being overheated. Tortugas; Dec. 24, 1912; "Fish Hawk"; 1 large male, 11 in shells, "sand hermit crabs, very abundant".

Texas: Tuxpan, "Dr. Lincecum", 1 juv. in shell.

Mexico: Vera Cruz, Boca Andrea; Dec. 26, 1954; J. Tamsitt; 1 male.

Bahamas: Albert, Fortune Id.; July 13, 1930; 241 juveniles; P. Bartsch.

Jamaica: Rock cliffs west of Discovery Bay; June 13, 1958; 8 females, 6 males (largest specimens in shells of Livona pica Linnaeus.

British Honduras: Belize, H. S. Howe, 1 in Melonzana shell.

RANGE: Bermuda (Haas, 1950), Palm Beach Co., Fla., Tortugas Ids. and Texas, south to Venezuela. Terrestrial and littoral.

DESCRIPTION: Left cheliped massive; chela articulating almost horizontally with carpus, length only a little greater than height. Fingers short, heavy; with sharp calcareous teeth. Faces of all pereopods covered sparsely but regularly with small dark tubercles. Minor cheliped small and laterally compressed but not weak. Cutting edges of fingers

sharp, hoof-shaped tips corneous. Carpi of both chelipeds with a distodorsal calcareous spinule on the inner margin. Palms with a dense brush of fine hair on inner dorsal surface. Minor chela with numerous setae below.

Walking legs strong, those on left heavier and shorter than those on right. Propodus of second on left very deep with a row of fine teeth on ventral and distal margin; dactyl short, swollen and with a ventral margin of fine teeth on proximal two-thirds. Dactyls with fine tufts of short dark setae dorsally and laterally. Long yellow setae ventrally, very sparse in second on left.

Fourth pereopod chelate, short, laterally compressed; a large rasp of minute scales covering distal two-thirds of propodus. Dactyl rudimentary, tooth-like. Fifth pereopod chelate; not compressed; chela long, with a fine rast on outer surface.

Gill pairs seven, each gill with two rows of complete leaf-like lamellae. Outer maxillipeds approximated. Separation of coxae of pereopods increasing evenly to fifth; coxae of latter approximated, male openings on posterior, guarded by tufts of fine, dark setae. Abdomen membranous, covered with short, fine setae. Posterior abdominal appendages reduced, telson feebly bifurcate.

COLOR: Male from Jamaica in formalin two months. Carapace and proximal parts of walking legs prune purple; latter shading through pansy and maroon purples to buff

near horny tips. Chelipeds mainly prune and plum purple to finger tips where white teeth and tubercles arise from a background of heliotrope purple. A fleshy ochraceous fold on distal margin of carpus of main cheliped. Saffron yellow setae along margins of pereopods and other parts of body. Tips of antennular flagella scarlet vermillion. Smaller specimens lighter in color.

MEASUREMENTS (mm.): Shield, length 19, ant. width 8, post. width 15; carapace 35; eyes 7; left chela, length 32, height 26, width 15.5, dactyl 17.5, gape 10; right chela, length 17, height 13.5, width 7.5, dactyl 10.5, gape 7; third right pereopod, merus 14, carpus 15.5, propodus 19, dactyl 27.51, third left pereopod, merus 13, carpus 14.5, propodus 16, dactyl 22.

REMARKS: The characters given in the description will frequently apply to the genus. The several species are tropical with the center of abundance in the Indo-Pacific.

Family Pylochelidae Bate

Body crayfish-like, symmetrical; abdomen covered by contiguous calcified tergal plates. Second and third pereopods long, fourth and fifth short, subchelate. Eyes variable, well-developed in some species, much reduced in others. Eggs large, few in number, protected by tail fan.

The genus Cheiroplatea Bate is here united with Pylocheles, as was previously suggested by Milne Edwards and Bouvier (1893) and Alcock (1905). There has been shown to be a gradation from species with a well-pigmented cornea to those with the cornea lacking pigment, the main character upon which Cheiroplatea was established.

Key to Genera

1. External maxillipeds cheliform.....Pylocheles.
External maxillipeds not cheliform.....2.
2. Gill pairs 14, eyes well developed.....3.
Gill pairs 12, eyes reduced and pale.....Parapylocheles.
3. Chelae forming an operculum.....Pomatocheles.
Chelae not forming an operculum.....Mixtopagurus.

Genus Pylocheles A. Milne Edwards

Shield and posterior part of carapace united. Eyes

varying from prominent to reduced; cornea lacking pigment in species formerly assigned to Cheiroplatea. Eye scales reduced or absent.

Chelae and produced anterior parts of carpi form an operculum.

Key to Species

1. Eyes less than half as long as shield.....2.
Eyes little shorter than shield.....3.
2. Cornea lacking pigment.....scutata.
Cornea pigmented.....inarmatus.
3. Dorsal row of spines in carpus parted at the midline by a furrow.....partitus.
Transverse dorsal row of spines on carpus continuous.....agassizi.

Pylocheles agassizi A. Milne Edwards

Pylocheles agassizi A. Milne Edwards, 1880, p. 38.

--Gordan, 1956, p. 339.

RANGE: Barbados to St. Lucia; 154 to 200 fms.

DIAGNOSIS: Chelipeds armed on margins of propodus and on carpal crest with strong spines. Crest of carpus unbroken by a median shallow furrow. Otherwise this species is very near P. partitus.

Pylocheles inarmatus n. sp.

MATERIAL EXAMINED: Male holotype, MCZ 126677; 22° 07' N., 81° 08' W.; 150-170 fms.; Feb. 25, 1938; "Atlantis" sta. 2963B.

RANGE: Type locality, Bahía de Cochinos, south of Santa Clara Province, Cuba.

DIAGNOSIS: Eyes short, less than half as long as shield; chelipeds unarmed.

DESCRIPTION: Carapace well calcified dorsally, gill covers strong. Frontal margin indented medially, raised and less indented behind eyes. V-shaped cervical groove approximately bisects carapace. Carapace lightly setose in depressions and on numerous lateral punctae.

Eyes small, stalks somewhat narrowed between bases and cornea; latter Indian red and with a honey-combed appearance. Antennular peduncles exceed eyes by terminal $2 \frac{1}{3}$ segments. Antennal peduncle exceeds eyes by almost $1 \frac{1}{2}$ segments. Second segment with distal half raised, a spine below base of acicle, outer projection strong, not spinous. Acicle crested with ten or more denticles on dorsal margin. Flagellum short, scarcely reaching fingers of chelae.

Chelipeds narrow, of medium length. Anterodorsal surface of carpus raised, produced forward. Dorsal surface of chela pubescent, silt laden; margins marked by even

denticles hidden by dense setae. Fingers closing only on distal third, with a wide proximal gape; tip of dactyl a strong bifid tooth closing well inside stout calcareous tip of pollex and meeting a strong tooth between tip and wide gape. Second and third pereopods sparsely setose on margins; dactyls with two rows of short setae dorsally and a row of longer setae composed of several separate combs on lower surface; corneous tips yellow, decurved. Carpus of fourth pereopods with a strong anterodorsal denticle protruding from inner side of propodal base. Propodus also bears an anteroventral spinule. Dactyl short, stout, with numerous tufts of setae. Fifth pereopods subchelate, dactyl minute; a rasp on dorsolateral surface of propodus.

First pair of male appendages feeble, with terminal segment broad, spatulate. Second pair much stronger, with a stout, anterior denticle on second segment; terminal segment heavy, curved, with a spatulate tip. Abdominal somites punctate; sixth has a small, square notch at terminal midpoint. Terminal segments of uropods have strong propodal rasps composed of short, sharp spines as on propodi of fourth and fifth pereopods. Base of telson with a bare, fleshy spot near each anterolateral margin; terminal flap broad, oval.

MEASUREMENTS (mm.): Body length 70; carapace, length 18.5, width 15.0; shield 11.0; eyes 4.4; chela, length 22.5,

width 8.0, dactyl 8.5; third right pereopod, basis-ischium 5.0, merus 11.2, carpus 8.5, propodus 9.5, dactyl 9.7.

Pylocheles partitus Benedict

Pylocheles partitus Benedict, 1901, p. 775, figs. 5, 6.

--Gordan, 1956, p. 340.

MATERIAL EXAMINED: Three specimens from Cozumel Id., Yucatan. Male type, labeled "Pylonagurus partitus B., Cozumel, in sponge, Jan. 29, 1885"; the "Albatross" made 4 stations that day at approximately 20° 19' N., 87° 03' W.; at depths between 137 and 231 fms.; same location, "Albatross" sta. 2359; 2 ovig. females.

RANGE: Known only from type locality.

DIAGNOSIS: Parts of pereopods included in operculum well armed. Eyes little shorter than shield, corneas swollen. Antennal flagellum equaling chelipeds.

DESCRIPTION: Carapace well calcified, slightly narrowed anteriorly. Gastric region smooth, somewhat elevated; bordered anteriorly, except in middle, by a row of setae. Front with four spinous teeth; median separation somewhat longer, but less recessed, than lateral ones. Carapace sparsely pubescent lateral to shield, in cervical groove and posteriorly. Cervical groove in shape of a shallow V.

Eyes short, cornea swollen; eye scales absent. Antennules exceed eyes by terminal $1\frac{1}{2}$ segments. Extended

flagellum reaches dactyl of chela. Second segment of antennal peduncle with elevated boss bearing two spinules posterior to distal spine. Acicle with about 13 spinules forming a serrate edge ventrally; two sharp spines on dorsal surface just behind terminal spine. Flagellum moderately ciliated, nearly equal to chelipeds. Chelipeds equal, carpus and chela forming an operculum bordered by calcareous spines. Carpus with distally protruding crest equal to one-third of total length of carpus. Carpal crest with six large spines on leading edge, three on each side of deep median groove; lateral edges with much smaller spines; crest almost making a 90° angle with face of manus with latter fully raised. Approximately ten spines appear on inner edge of hand, 25 on outer margin and ten on dactylar margin. Surface of hand covered with evenly rounded denticles occurring mainly in rows. Bases of denticles setose; longest and densest setae marginal. Cutting edges of fingers with heavy, calcareous teeth fused except for proximal two of dactyl. Tip of latter fits into groove between tip of pollex and shorter, ventral tooth. Chela moving in vertical plane with carpus.

Second and third pereopods without spines; sparsely setose dorsally and ventrally, with small clusters of setae rising from sparse punctae on all dactylar surfaces. Fourth pereopods with a single row of corneous-tipped scales forming a rostrum. Fifth pereopods with subchelate rasp

covering about half of dorsal surface of propodus adjacent to leading edge. Dactyl small, shorter than propodal width.

Gonopods long, distal segments spatulate. Sixth abdominal segment with a raised sternal band about one mm. wide. Uropods with a sharp spine on posterior edge on either side. Abdominal plates, uropods and telson evenly setose except on raps of uropods.

Eggs carried by one female number about 15, each 1.5 mm. in diameter.

MEASUREMENTS (mm.): Body length 35, carapace, length 11, width 9.3; eyes 4.8; shield 6.7; chela, length 11.3, width 5.8, dactyl 4.7.

Pylocheles scutata (Ortmann) n. comb.

Chiroplatea scutata Ortmann, 1892, p. 275, pl. 12, fig.

4.

Chiroplatea scutata Alcock, 1905, p. 153.

Chiroplatea scutata Boas, 1926, p. 45. --Gordan, 1956, p. 307.

DIAGNOSIS: (after Ortmann, 1892) Carapace nude; rostrum blunt, rounded; all three anterior teeth tipped with a fine denticle. Eyes conical, shorter than peduncles of antennules.

Carpus with a dentated crest; face of chela finely setose and spiney. Walking legs sparsely setose, dorsal

margins of carpi and propodi finely spined.

This species was described from a male taken in the "Gulf of Mexico" by Alexander Agassiz and sent to Ortmann. It is very likely from a considerable depth.

Genus Mixtopagurus A. Milne Edwards

Mixtopagurus paradoxus A. Milne Edwards

Mixtopagurus paradoxus A. Milne Edwards, 1880, p. 39.

--Gordan, 1956, p. 319.

Mixtopagurus gilli Benedict, 1901, p. 777, fig. 7.

--Gordan, 1956, p. 319.

MATERIAL EXAMINED: Eleven specimens from eight stations. Holotype male (at MCZ), Barbados; 200 fms.; "Blake" sta. 291; in Xiphosura shell; body about 2 cm. long.

Off North Carolina: 34° 39' N., 75° 33' W.; 107 fms.; "Albatross" sta. 2601; 1 female (type of M. gilli Benedict).

"Off St. Augustine": 170-190 fms. probably "Combet", 1 female.

Gulf of Mexico: 29° 42' N., 88° 25' W.; 21 fms.; Feb. 14, 1950; "Oregon" sta. 260; 1 male. 27° 48' N., 94° 40' W.; 200 fms.; May 6, 1956; "Oregon" sta. 1501; 1 ovig. female.

Key West, Fla.: 24° 21' N., 81° 52' W.; 109 fms.; Feb. 19, 1902; "Fish Hawk" sta. 7282; 1 male, 1 female.

Guadeloupe: 175 fms.; 1 juv. female, MCZ 6327.

Off mouth of Orinoco River: 09° 45' N., 59° 45' W., 200 fms.; Nov. 3,4; 1957; "Oregon" stas. 1984 and 1989, 1 male, 3 females (1 ovig.). Female from sta. 1984 was found in a shell of Tugurium longlevi.

RANGE: North Carolina and Gulf of Mexico to mouth of Orinoco river; 21? to 200 fms. (only one record above 107 fms.).

DIAGNOSIS: Large species with abundant setae on most appendages and on abdominal margins. Eyes long, stalks curved, cornea not swollen. Symmetry of telson highly variable.

DESCRIPTION: Shield as wide as long, strongly indented near each posterolateral border. Rostrum obtuse, almost equal to lateral teeth; latter connected by a fine marginal line. Each anterolateral margin marked by a heavy, rounded ridge bordered by a deep cleft. Cardiac plate somewhat funnel-shaped. Lateral regions of carapace with numerous tufts of setae. Gill cover leathery.

Eyes long, a little swollen at each end. Eye scales minute, tipped by a spinule. Antennular peduncle slightly exceeds eyes. Antennal peduncle not reaching cornea; base with strong, outer spine; second segment with diagonal, median depression, three or four spines on outer projection, a spinule or denticle on inner angle; third segment with a distoventral spine, fourth with a distodorsal. Acicle armed with numerous spines, more on inner side than on outer.

Acicle and projection of second segment bear long, abundant setae dorsally. Flagellum short but easily reaching chela; densely setose.

First three pereopods well armed, densely setose on the three terminal segments. Merus of chelipeds with disto-dorsal marginal and submarginal rows of spines, other spines on ventrolateral margins. Carpus armed with ten or more spines on inner dorsal surface; these may be in two rows or irregular. Shorter spines appear on distodorsal margin. Inner dorsal margin of palm armed as in carpus; remaining surface with numerous blunt spines becoming shorter distally. Closed fingers with even gape to black, horny tips; latter hoof-shaped, that of dactyl apparently composed of several welded teeth proximally.

Second pereopods with varying numbers of strong spines on dorsal angles of carpus and propodus; spines obscured by stiff setae. Dactyl with strong tufts of setae except on inner margin; claws sharp, continuing dorsal curvature. Third pereopods similar to second but with fewer spines on carpus, none on propodus. Propodus of fourth pereopods with a large ventral rasp two scales wide proximally, about ten distally. Dactylar rasp a row of about 12 scales. Propodus of fifth pereopods short, broad, with a rasp on distal four-fifths.

Female gonopods approximated at bases as are first pair in male. Second pair of male strong, with a short

exopod; endopod broad, spatulate distally. Telson varies from symmetrical, or nearly so, in males to strongly asymmetrical in females where it apparently contributes to formation of a broad pouch by elongation of the left lobe. Female carries several hundred eggs 1.4 mm. in diameter at the eyed stage.

Family Diogenidae Ortmann

The approximation of the third maxillipeds at the midline is the main character separating this family from the Paguridae. Other characters which generally apply are given in the following diagnosis.

Shield equal to or longer than cardiac plate; latter narrowed posteriorly. Transverse groove present just behind frontal margin. Gastric region well defined. Posterior parts of gill covers often forming calcareous plates.

Eyes frequently long and narrow; cornea moderately dilated in a few genera. Eye scales mediumly separated or or closely spaced; often tipped with several fine spinules. Antennular peduncle usually equaling or exceeding eyes. Antennal peduncle armed on second segment with an inner denticle and an outer spine; acicle dentate or spinous on sides as well as at tip.

Chelae equal or left is larger, except in Petrochirus, in which right is a little larger. Articulation of chela with carpus horizontal or oblique, never vertical. Chelipeds and walking legs usually well armed, more or less setose. Propodal rasp of fourth pereopods always composed of several rows of scales; fifth pereopods chelate or subchelate, with a well developed rasp.

Two pairs of gonopods present on males in three genera, on females in two. Brood pouches present in two genera.

REMARKS: This family contains only 14 genera and the characters which separate them are often different from and less clearly defined than those which separate genera in the Paguridae. The great majority of the species are littoral or confined to the upper shelf, and are most abundant in warm temperate and tropical regions. Pagurids found on reefs usually belong to this family. While many are small, some, such as those in the genus Petrochirus, are the largest aquatic pagurids. Eight genera and at least 29 species are present in the western Atlantic above the equator.

MacDonald, et al., (1957) present convincing evidence for the separation of this former subfamily as a complete family, based on larval development as well as on well known adult characters.

Key to Genera of the World

1. Paired appendages present on first and second abdominal segments of male.....2.
First and second abdominal segments of male lacking paired appendages.....4.
2. Paired appendages on first abdominal segment of female; brood pouch well developed or, rarely, rudimentary.....3.
First abdominal segment of female without paired appendages; brood pouch lacking.....Paguristopsis.
3. Fourth pair of pereopods chelate, eyestalks stout.....Pagureopsis.

- Fourth pair of pereopods not chelate, eyestalks slender.....Paguristes.
4. Chelipeds equal or subequal.....5.
Chelipeds unequal, right or left larger.....8.
5. Chelipeds modified to form an operculum.....Cancellus.
Chelipeds not forming an operculum.....6.
6. Fingers acuminate, antennal flagellum short, with two rows of long, fine setae. Gill pairs 13.....Isocheles.
Fingers spooned or hoof-shaped at tips; antennal flagellum moderately long, nude. Gill pairs 14.....7.
7. Finger tips spooned; most species littoral, one found in deep water.....Clibanarius.
Finger tips hoof-shaped; most species said to be fossorial.....Aniculus.
8. Right cheliped perceptibly larger than left.....Petrochirus.
Left cheliped larger than right.....9.
9. Finger tips calcareous.....10.
Finger tips corneous and dark.....12.
10. Rostrum replaced by a movable scale on ophthalmic somite.....Diogenes.
Rostrum not replaced by a movable scale.....11.
11. Antennal flagellum nude; left hand bare or nearly so....Calcinus.
Antennal flagellum and left chela setose.....Troglonagurus.
12. A stridulating apparatus present on inner face of chela.....Trizonagurus.
Inner face of chela without a stridulating apparatus..13.
13. Endopods of maxillae each with a well developed lateral appendage. Female with unpaired pleopods biramous.....Pseudopagurus.

Endopods of maxillae lacking lateral appendages.
 Females with first three unpaired pleopods tri-
 ramous.....Dardanus.

Genus Calcinus Dana

Calcinus tibicen (Herbst)

Cancer tibicen Herbst, 1791, p. 25, pl. 23, fig. 7.

Pagurus tibicen Bosc, 1801, p. 78.

Pagurus sulcatus Milne Edwards, 1836, p. 279.

Calcinus sulcatus Stimpson, 1858, p. 234. --Gordan,
 1956, p. 305.

Calcinus formosus Neumann, 1878, p. 31. --Gordan,
 1956, p. 304.

Calcinus tibicen Miers, 1879, p. 491. --Gordan, 1956,
 p. 305.

MATERIAL EXAMINED: Twenty-eight specimens from five
 localities.

Tortugas: (Specimens collected by W. L. Schmitt)

Southern end of Bush Key Reef; July 14, 1932; 4 males, 6
 females (2 ovig.). July 31, 1924; 3 males, 2 ovig. females.
 July 5, 1932; 2 males, 1 female. Under rocks on outer side
 of Bird Key Reef; July 11, 1930; 1 male, 1 ovig. female.
 June 21, 1932; 1 female, "Chelipeds malachite green except
 usual yellow fingers and margins to joint."

Key West: Aug. 21, 1958; E. L. Pierce; 2 males, 2 ovig.
 females.

Bahamas: Cat Cay, May 4, 1958; J. Randall, 1 male.

Haiti: Reef east of Tierra Baha Road, Tortugas Is.,

$\frac{1}{2}$ fm.; Mar. 21, 1937; W. L. Schmitt; 1 male.

Martinique: Smith Bay, reef; Apr. 25, 1957; W. L.

Schmitt, 1 male.

DIAGNOSIS: Relatively small reef species. Left cheliped massive. Body and first three pereopods nude except ventrally on dactyl of walking legs. Propodus of third left pereopods with a broad outer sulcus.

DESCRIPTION: Shield evenly convex, glabrous; provided with numerous fine punctae. Postcervical part of carapace membranous. Rostrum triangular, not reaching eye scales; lateral teeth lacking. Eyes long, slender, heaviest at base of stalk; cornea little swollen. Eye scales small, convex, narrowly separated. Antennular peduncle reaching narrow white band behind cornea; those of antennae a little shorter. Second segment of antennal stalk with a minute inner denticle, outer angle bifid. Acicle unusually short, not reaching midpoint of eyestalk. Flagellum nude, barely reaching dactyl of chela; acicles short.

Chelipeds strong, left massive; both unarmed. Finger tips calcareous, hoof-shaped. Walking legs strong, subequal to chelipeds. Dactyl much shorter than propodus. Horny claw large, sharp. Propodus of third left pereopods with an outer, subdorsal sulcus with fine granular ridges. (This structure is overhung by a sharp, dorsolateral ridge

and compares with the structure found on the same segment in Dardanus. It may be a stridulating apparatus).

Fourth pereopods chelate, short, stout; fifth pair long and narrow. The four unpaired pleopods of the male unusually strong, biramous. Telson broad, subsymmetrical, unarmed, fringed with setae.

COLOR: Male from Cat Cay after 6 months in formalin. Following parts scarlet, thickly peppered with white punctae: Shield, proximal four-fifths of eyestalks, second segment and acicle of antennal peduncle, first three pereopods (except dactyl and tips of chelae), and broad bands on merus of fourth pereopods. Color darkest and white spots most numerous on chelipeds. Eyestalk with a band of white next to cornea. Eye scales white. Tips of chelae shading to white. Dactyl of walking legs white with a wide median band of scarlet.

MEASUREMENTS (mm.): Male from Cat Cay. Shield, length 5.4, width 4.0; carapace 9.7; eyes 4.4; left chela, length 7.3, width 4.9, dactyl 4.8; right chela, length 5.0, width 3.9, dactyl 2.5; third right pereopod, basis-ischium 2.3, merus 4.2, carpus 3.1, propodus 4.8, dactyl 3.5.

Genus Cancellus H. Milne Edwards

Body and appendages symmetrical, shortened, adapted for living in siliceous sponges or rocks. Shield glabrous,

broader than long; frontal projections nearly equal. Cardiac plate as broad as long. Abdomen membranous, spherical, shorter than carapace.

Eyes moderate, shorter than shield, cornea not dilated. Eye scales small, simple, widely spaced. Antennular peduncle strong, equaling eyes; that of antennae short. Second segment of latter with a sharply projecting shelf on distodorsal half, with spinous denticles on inner and outer angles. Acicle with three spines, including terminal, on anterolateral edge; a short spine on inner proximal edge. Terminal segment reaches little more than halfway on eye-stalk. Flagellum feeble, not exceeding that of antennule.

Chelipeds massive; chelae triangulate in cross section, deeper than wide, crested on inner margin. Carpus and chela of chelipeds and last three segments of second pereopods form an operculum, segments of the second pair curving around the chela. Carpus of chelipeds oblique, seeming little movable. Fingers extremely stout and short; tips dark-corneous, blunt. Dactyl of walking legs shorter than propodus. Female openings large, rounded. Sternum between third pair of coxae with a round boss topped by fine setae.

Fourth pereopods short, chelate; propodus little longer than broad, with circular rasp covering distal two-thirds of surface. Dactyl short, occupying little more than middle third of anterior edge of propodus, with four minute scales behind tip. A tiny calcareous tubercle on

palm at base of dactyl. Fifth pereopods chelate, with a rasp about three times as long as broad and covering entire dorsal edge of palm. Fingers flattened, lightly spooned; a minute rasp on dactyl.

Posterior abdominal plate variously sculptured and armed, telson broader than long, bent under so that abdomen is little exposed ventrally.

Alcock (1905) quotes Milne Edwards and Bouvier as stating that the gill pairs number 14 and that of the two arthrobranchs on the third maxillipeds, one is rudimentary and the other non-plumose. However I can find but 13 pairs, six of which are quite rudimentary and only 6 of which have two rows of lamellae. They are disposed as follows: A pair of rudimentary arthrobranchs on the third maxillipeds and each of the first two pairs of pereopods; third pereopod with one complete arthrobranch and a second of a few lamellae in a single row, also a complete pleurobranch; fourth pereopod with four complete gills, a podobranch, two arthrobranchs, and a pleurobranch; the last segment has a large pleurobranch.

While the third maxillipeds are closely approximated and the gill formula similar to that of other genera in the Diogenidae, this genus seems to be the most aberrant member of the family. The three specimens of as many species known from the Caribbean region can be separated by the following key. Only additional material will determine the validity of the three.

Key to Species

1. Posterior abdominal plate, basal segments of uropods, and opercular parts ornately sculptured; abdominal plate armed on margins with many short spines...ornatus.

Abdominal plate and opercular parts not especially sculptured or as well armed; opercular surface more flat.....2.

2. Abdominal plate armed lightly.....spongicola.

Abdominal plate unarmed.....tanneri.

Cancellus ornatus Benedict

Cancellus ornatus Benedict, 1901, p. 772, fig. 1,2.

--Gordan, 1956, p. 306.

MATERIAL EXAMINED: Holotype female; "between delta of Mississippi and Cedar Keys," 28° 45' N., 85° 02' W.; 30 fms.; "Albatross" sta. 2405, gray sand, broken coral.

RANGE: Known only from type.

MEASUREMENTS (mm.): Shield length 6.0, width 6.5; carapace 8.2; eyes 4.6; chela, length 7.3, width 2.8, thickness 4.0, dactyl 2.7.

Cancellus spongicola Benedict

Cancellus spongicola Benedict, 1901, p. 773, figs. 3,4.

--Gordan, 1956, p. 306.

MATERIAL EXAMINED: Holotype male, USNM 9549; off Arrowsmith Bank, Yucatan; 20° 59' N., 86° 23' W.; 130 fms.;

coral bottom, Jan. 22, 1885; "Albatross" sta. 2345.

RANGE: Known only from type.

MEASUREMENTS (mm.): Shield, length 6.6, width 7.8; carapace 9.5; eyes 5.0; chela, length 9.2, width 3.4, thickness 4.4, dactyl 3.2.

Cancellus tanneri Faxon

Cancellus tanneri Faxon, 1893, p. 167. --Gordan, 1956, p. 306.

MATERIAL EXAMINED: Type and one other specimen.

Holotype male, a small specimen 18 mm. long, at MCZ; Gulf of Panama; "Albatross".

Cuba: Off Havana, 23° 05' N., 82° 33' W.; 260 fms.; Mar. 23, 1939; "Atlantis" sta. 3303; 1 female in cavity of a compact siliceous sponge.

RANGE: Known only from these two specimens.

MEASUREMENTS (mm.): Shield, length 7.5, width 7.8; carapace 8.7; eyes 5.0; chela, length 8.4, width 3.2, thickness 4.3, dactyl 3.5.

REMARKS: This is the first record of this species from the Atlantic and apparently only the second specimen taken. The type differs from the Cuban specimen only in the presence of a deep puncta behind each depression in the frontal margin. Comparison with a type specimen of C. parfaiti Milne Edwards and Bouvier at the MCZ indicates a close relationship between these two, parfaiti differing

mainly in the presence of a rounded protuberance on the base of each uropod.

Genus Clibanarius Dana

Shield squarish, longer than broad, frontal projections subequal. Cardiac plate narrowed posteriorly, broadest about a third of distance from anterior end. Eyes slender, elongate but shorter than shield. Eye scales usually closely spaced; widely so in C. anomalus. Antennular peduncles from three-fourths to one and one-fourth times as long as eyes. Antennal peduncles usually shorter than eyes, occasionally equal; acicles dentate or spinous; flagella nude, never exceeding pereopods.

Chelipeds usually equal, chela articulating horizontally with carpus. Fingers spooned, tips hoof-shaped and darkly corneous. Walking legs strong, usually compressed laterally. Rasp of fourth pereopods ovoid, larger than that of fifth pereopods; fourth pair subchelate, fifth chelate.

Unpaired pleopods four in both sexes. Telson sub-symmetrical, little indented at midline.

Gill pairs 13, lamellae phyllobranchiate.

Key to Species

1. Eye scales widely spaced; a deep-water form....anomalus.
Eye scales approximated; littoral forms.....2.

2. Dactyl of walking legs longer than propodus.....3.
 Dactyl of walking legs shorter than propodus.....4.

3. Propodus of walking legs with four narrow stripes of white separated by broad dark stripes. Eye scales minutely spined at tips. Antennular peduncles exceeding eyes.....vittatus.

Propodus of walking legs with a dorsal, a lateral, and a ventral stripe of dark color of same width as intervening light stripes. Eye scales tipped with three calcareous spinules. Antennular peduncles not more than equaling eyes.....sclopetarius.

4. Propodus of walking legs with a broad, light stripe bordered by dark green above and below. Eyes minutely swollen at cornea, stalks as thick at mid-section as at cornea.....brasiliensis.

Color of legs and body mainly blue. Walking legs banded rather than striped. Eyes somewhat bulbous at cornea; stalks most slender in mid-section.....tricolor.

Clibanarius anomalus Milne Edwards and Bouvier

Clibanarius anomalus Milne Edwards and Bouvier, 1893, p. 157, pl. 11, figs. 13-23. --Gordan, 1956, p. 307.

MATERIAL EXAMINED: Type and one other specimen.

Holotype female; Barbados, 100 fms.; "Hassler."

Caribbean Sea: West of Rosalind Bank, 16° 35' N., 80° 55' W., 100 fms.; Aug. 24, 1957; 1 male.

RANGE: Caribbean Sea, western and southeastern parts 63 to 173 fms.

DIAGNOSIS: Pereiopods short, dactyl of walking legs nearly equaling propodus. Outer surfaces of walking legs abundantly punctate. Gill covers form calcified plates anteriorly.

DESCRIPTION: Shield flat, subquadrate, heavily calcified; surface shallow punctate. Rostrum blunt, exceeding lateral teeth. Cardiac plate broadest near midpoint, narrowed posteriorly. Gill covers form calcified plates on anterior three-fifths.

Eyes narrow, little swollen at either end; stalks with an uncalcified line along outer surface. Eye scales small, with short tips. Antennular peduncle short, failing to reach cornea of eye. Antennal peduncle also short; base with a short, outer protuberance bearing fine denticles and setae. Second segment with inner angle rounded, outer not produced but with a few denticles. Acicle short, barely reaching terminal segment of peduncle; feebly armed. Flagellum nude, exceeding chelipeds, composed of very short articles.

Chelipeds subequal, merus armed on distodorsal margin. Carpus and propodus armed with large denticles dorsally. Fingers spooned, gaping except at black, hoof-shaped tips. Walking legs short, strong; merus of first pair armed with numerous denticles on ventral angle. Carpus and propodus of both pairs armed with rounded denticles dorsally; dactyl with a line of corneous spinules on ventral angle; corneous claws stout. Outer surfaces marked by irregular rows of numerous punctae.

Fourth pereopods short, heavy; propodal rasp large, covering about three-fifths of surface. Dactyl short, with

a curving row of fine scales. Hand of fifth pair narrow, pointed distally, with a rasp on outer distal half. Sternal projection between third pair of coxae broad, heavy, setose on anterior margin. Coxal openings of fifth pair medial to ventral callosities. Tergal plates of abdomen cover most of dorsal surface. Telson asymmetrical; left terminal lobe larger; margins unarmed, setose.

COLOR: Specimen from "Oregon" sta. 1890 in alcohol six months. Shield and head appendages white. Walking legs Indian orange distally; forming stripes which enclose rows of punctae more proximally. Chelipeds missing.

MEASUREMENTS (mm.): Shield, length 6.0, width 5.2; carapace 10.0; eyes 4.5; third pereopod, basis-ischium 2.3, merus 5.3, carpus 4.0, propodus 5.1, dactyl 5.5.

Clibanarius brasiliensis Dana

Clibanarius brasiliensis Dana, 1852, p. 467, pl. 29, fig. 7. --Gordan, 1956, p. 308.

Clibanarius antillensis Stimpson, 1859, p. 235.
--Gordan, 1956, p. 307. --?Chace, p. 152.

Clibanarius brachyops Bouvier, 1918, p. 9. --Gordan, 1956, p. 308.

MATERIAL EXAMINED: One hundred and forty-one specimens from Florida and Puerto Rico.

Florida: Palm Beach Inlet; July 7, 1957; R. Christensen; 1 ovig. female, carapace length 4.2mm. South Lake

Worth Inlet; Aug. 25, 1957; R. Christensen; 3 females (2 ovig.). Key West; July, 1957; E. L. Pierce; 1 male.

Puerto Rico: Maguez Id., Mayaguez; Jan., 1959; J. R. Lopez; 88 males, 48 females (32 ovig., 2 with a parasitic isopod under the gill cover).

RANGE: Palm Beach, Fla., to Brazil.

DIAGNOSIS: Shield abundantly punctate. Eye scales squarish, with four or five spinules distally, the inner two subequal. Eyes thick and short in small specimens.

DESCRIPTION: Shield sparsely setose laterally; punctae most evident on gastric region. Rostrum blunt triangular, exceeding lateral teeth. Eyes slender, cornea little swollen; stalks slightly curved out. Eye scales approximated, squarish; with five minute spinules interspersed with one or two setae on distal margin. Antennular peduncles exceeding eyes by a fourth of terminal segment; those of antennae reaching cornea. Second segment with spinous denticle on outer angle; acicle with three, including two at tip. Flagellum stout, nude, shorter than pereopods.

Merus of cheliped with two spines on outer disto-ventral angle. Carpus with a spine on inner distal angle, two smaller ones behind it. Faces of chelae armed with many strong denticles with corneous tips.

Walking legs strong, short, equaling chelae. Dactyl shorter than propodus with seven corneous spinules on

ventral edge; setae sparse; claws very dark and strong. Fourth pereopods with a distodorsal calcareous spinule on carpus. Telson subsymmetrical with an even fringe of setae.

COLOR: Specimens from Palm Beach Co. after 1½ years in formalin. Carapace hazy blue posteriorly. Shield dark greenish brown with white punctae. Chela brown with white dots and denticles. Walking legs olive green dorsally and ventrally with broad white stripes on sides except on dactyl. Latter with proximodorsal stripe of brown, remainder white.

MEASUREMENTS (mm.): Male from Key West. Shield, length 6.0, width 4.1; carapace 10.0; eyes 4.2; chela, length 6.4, width 2.6, dactyl 3.6; third right pereopod, basis-ischium 2.6, merus 4.6, carpus 3.5, propodus 5.4, dactyl 4.6.

Clibanarius scolopetarius (Herbst)

Cancer scolopetarius Herbst, 1791, p. 23, pl. 23, fig. 3.

Pagurus scolopetarius Bosc, 1802.

Pagurus tuberculosus H. Milne Edwards, 1848, p. 278.

Pagurus cubensis Saussure, 1858, p. 39. --Gordan, 1956, p. 308.

Clibanarius cubensis Rathbun, 1900, p. 144.

Clibanarius scolopetarius Stimpson, 1859, p. 85.

--Gordan, 1956, p. 310.

Clibanarius tuberculosus Stimpson, 1858, p. 234.

Clibanarius carnescens Miers, 1877, p. 658, pl. 66,

fig. 2.

Clibanarius formosus Ives, 1891, p. 182, pl. 5,

figs. 1,2.

Clibanarius hebes Verrill, 1908, p. 450, figs. 65-66.

MATERIAL EXAMINED: Two specimens from Florida. Palm Beach Co., South Lake Worth Inlet, Aug. 25, 1957; R. Christensen; 1 male. Key West; July, 1957; E. L. Pierce; 1 female.

RANGE: Palm Beach Co., Fla. to Brazil.

DIAGNOSIS: Dark and light stripes of walking legs nearly equal in width. Many small punctae on gastric region of shield. Eye scales with three calcareous spinules at tip. Acicle with five spinules, including one at tip.

DESCRIPTION: Shield uneven, sparsely setose; numerous punctae medially. Margin raised between lateral teeth. Eyes little shorter than shield, narrowed medially, curving outward distally. Eye scales approximated distally; three terminal spinules. Antennular peduncle reaching cornea; that of antenna a little shorter. Second segment with a spinule on outer angle, a minute denticle at inner. Acicle with three spinules on inner margin, one on outer margin just behind tip.

Merus of chelipeds with a spinule on outer distoventral angle, six denticles on inner ventral angle. Carpus with a stout spine at inner distodorsal angle. Chela presents

several strong denticles, those on dactyl with corneous tips. Setae sparse but strong on dorsal surfaces.

Walking legs with a short spine just below outer distal angle of merus, a stronger one at distodorsal angle of carpus. Dactyl rather sparsely setose; a distoventral row of fine, corneous scales behind strong claw. Fourth pereopods with a distodorsal calcareous spinule on carpus. Friction pads numerous on ventral surfaces of pereopods. Telson short; three small spinules on distal left side.

COLOR: Specimen in formalin $1\frac{1}{2}$ years. A pattern of burnt sienna and orange rufous stripes on walking legs; darker stripes slightly broader at most points. Shield and posterior part of carapace giving rise to fine setae.

MEASUREMENTS (mm.): Male from Palm Beach Co. Shield, length 5.5, width 4.7; carapace 11.0; eyes 5.0; chela, length 5.2, width 2.3, dactyl 3.0; third right pereopod, basis-ischium 2.9, merus 4.7, carpus 3.6, propodus 6.8, dactyl 7.4.

Clibanarius tricolor (Gibbes)

Pagurus tricolor Gibbes, 1850, p. 189.

Clibanarius bicolor Stimpson, (lapsus calami), 1859, p. 39.

Clibanarius tricolor Stimpson, 1858, p. 234. --Gordan, 1956, p. 310.

Clibanarius tricolor Heilprin, 1888, p. 321; erroneous

spelling of Clibanarius Dana.

MATERIAL EXAMINED: South Lake Worth Inlet, Aug. 25, 1957; R. Christensen; 12 males, 10 females (1 with ovaries filled with eggs).

RANGE: Palm Beach Co., Fla., and Tortugas Ids. to Puerto Rico.

DIAGNOSIS: Merus, carpus, and propodus of walking legs with deep punctae on outer and dorsal surfaces. Legs banded rather than striped.

DESCRIPTION: This species is very difficult to distinguish from C. antillensis in alcoholic specimens. The strikingly different color pattern distinguishes fresh material. The following remarks apply to the present species and will aid in separation of the two species.

Shield less punctate. Eyes tending to be a little more dilated at the cornea and more outwardly curved; stalks more slender in midsection. Eye scales usually slightly separated with the inner spinule strongest, the rest evenly decreasing in size.

Denticles of chelae tending to be a little more numerous and stronger.

COLOR: Specimens in formalin $1\frac{1}{2}$ years. Shield blue gray anteriorly, faded blue posteriorly. Posterior part of carapace suffused lightly with dark blue. Eystalks blue, cornea brown, eye scales faded blue with red bases.

Chelipeds dark brown with white patches and denticles.

Merus, carpus and propodus pale blue, dark blue distally. Punctae reddish brown. Bases of last three segments reddish orange. Dactyl white with minute red punctae.

MEASUREMENTS (mm.): Male from South Lake Worth.

Shield, length 3.0, width 2.3; carapace 5.3; left eye 2.3; chela, length 2.1, width 1.0, dactyl 1.1; third right pereopod, basis-ischium 1.3, merus 2.4, carpus 1.8, propodus 2.9, dactyl 2.5.

Clibanarius vittatus (Bosc)

Pagurus vittatus Bosc, 1802, p. 78, pl. 12, fig.1.

Pagurus symmetricus Randall, 1839, p. 133.

Clibanarius symmetricus Stimpson, 1859, p. 235.

Clibanarius vittatus Stimpson, 1859, p. 235. --Behre, 1950, p. 22. Wass, 1955, p. 148. --Gordan, 1956, p. 311. --Hildebrand, 1958, p. 159.

Clibanarius speciosus Miers, 1877, p. 658, pl. 66, fig. 3.

?Clibinarius lordi Miers, 1877, p. 659.

Clibinarius vittatus Hedgepeth, 1950, p. 78; 1950 b, p. 114; erroneous spelling of Clibanarius Dana.

MATERIAL EXAMINED: Seventy-three specimens from Florida, Texas and Mexico.

Mexico: Vera Cruz, Estero Grande Cabo Rojo, Apr. 27, 1955; H. H. Hildebrand; 1 male.

Texas: Matagorda Bay, Palacios Reef; Dec. 20, 1904;
T. E. B. Pope; 1 male.

Florida: Palm Beach Co., South Lake Worth Inlet;
Aug. 25, 1957; R. Christensen; 27 males, 33 females (12
ovig.). Franklin Co., 8 mi. west of Apalachicola; May 28,
1957; R. Christensen; 9 males. Tortugas, southern end of
Bush Key; July 14, 1932; W. L. Schmitt; 1 male. Key West;
July, 1957; E. L. Pierce; 1 female.

RANGE: North Carolina to Brazil, apparently not found
in most of Caribbean Ids.

DIAGNOSIS: Dark stripes on walking legs much wider
than light stripes. Eye scales minutely spined at tips.
Antennal peduncle feebly armed with a spinule on outer
projection of second segment and minute spinules at base
and tip of acicle.

DESCRIPTION: Shield squarish, gastric region lacking
punctae, minute rostrum not reaching base of eye scales.
Eyes slender, subequal to shield; dorsal stripe bordered by
minute setae. Antennular peduncle equaling eyes, that of
antennae not reaching cornea. Flagellum nude, equaling
pereopods.

Merus of chelipeds with a calcareous spine on outer
distoventral angle, denticles on inner ventral angle.
Carpi with a strong spine on inner distodorsal angle.
Chelae covered with numerous calcareous denticles, largest
medially.

Walking legs strong; rows of short, stiff setae on darker stripes. Carpus armed with a short distodorsal spine. Telson short, lacking a median cleft; margin with fine teeth.

COLOR: Pattern of specimens preserved in formalin. Propodus and dactyl of walking legs distinctively marked with three narrow white stripes on each side; background brown.

MEASUREMENTS (mm.): Female from Key West. Shield, length 12.0, width 10.0; carapace 23.5; eyes 11.0; chela, length 15.0, width 7.2, dactyl 9.5; third right pereopod, basis-ischium 6.2, merus 10.0, carpus 8.4, propodus 11.5, dactyl 17.7.

Genus Dardanus Paulson

Shield at least as long as broad, with median, uncalcified furrow stemming from cervical groove and branching to form a goblet-shaped outline. Lateral teeth prominent, blunt. Rostrum absent. Cardiac plate narrow; widest, and with a pair of marginal indentations, anteriorly.

Eyes stout, swollen at cornea, relatively shorter in adults than in young; with a tuft of strong setae at dorsal apex of stalk. Eye scales truncate, with four or more spines on distal margin; tips pointing inward. Antennular peduncle at least equaling eyes. Antennal peduncle equal.

ing or slightly exceeding eyes, acicle never exceeding; flagellum nude, equaling pereiopods. Maxillipeds with exopods flagellate; flagellum of first feeble.

Chelipeds unequal, left member largest; finger tips dark, corneous, meeting rather than crossing. Proximal parts of cutting edges composed of strong, calcareous teeth; corneous tips sharp-edged. Walking legs equaling chelipeds; propodus and dactyl of second on left ornamented with transverse stridulating ridges. Corneous tips small, sharp. Chelae articulating obliquely with carpi. Fourth pereiopods subchelate. Propodal rasp convex, long-ovoid, occupying most of lower half of outer surface. Dactyl overreaching propodus, with a row of spinules behind curved tip. Fifth pereiopods chelate, slender, long and with a rasp covering distal three-fifths of outer surface. Sternum between third pereiopods presents a round stalk with a tuft of setae at the tip. Male pleopods four in number, small, with outer ramus only a papilla. Abdominal terga narrow, uncalcified. Fleshy lobe with longitudinal crest of setae located ventral and slightly posterior to third pleopod. Telson feebly armed, asymmetrical.

Gills phyllobranchiate, numbering 14 pairs.

Key to Species

1. Major cheliped not much larger than minor. Chelae with transverse ridges armed with spinules.....petersi.

Major cheliped much larger than minor. Chelae with scalloped, plate-like tubercles lacking spines.....2.

2. Outer surface on propodus of third left pereopod with stout teeth on transverse ridges above lateral groove.....fecundus.

Transverse ridges scalloped on propodus of third left pereopod.....venosus.

Dardanus fecundus n. sp.

MATERIAL EXAMINED: Holotype female; off St. Augustine, Fla.; 30° 24' N., 80° 20' W.; 24 fms.; June 3, 1957; "Combat" sta. 353; in shell of Fasciolaria tulipa Linnaeus.

RANGE: Known only from type.

DIAGNOSIS: Large species, body of type about 15 cm. long. Left chela much larger than right. Surface of major chela armed with strong, conical teeth fringed by fine setae. Armament of propodus and dactyl of third left pereopod similar to that of major chela, with blunt denticles in rows.

DESCRIPTION: This species is closely related to D. venosus, differing mainly in the chelipeds, the stridulating surfaces of the third left pereopod and the color. Only the characters which differ from D. venosus are discussed in the following description.

Eyes strong, little swollen at cornea. Apical tuft of setae on eyestalk narrow. Antennular peduncle exceeds eyes by two-thirds of terminal segment.

Left cheliped 2.8 times as heavy by weight as right.

Spines on inner ventral margin of merus small, calcareous. Dorsal surface of carpus similar to that of D. venosus with spines proportionately stronger. Dorsalmost spines of propodus strong, becoming rounded teeth distally. Ventral margin presents row of short, strong denticles with corneous tips. Denticles on face of hand strong, occurring singly, or less often, as two or three united. Circular fringe of fine plumose setae surrounds each anteriorly. Teeth appear worn or broken at tips. Cutting edges of fingers with six teeth on dactyl (last two united), nine on pollex. Minor cheliped with numerous bristles on exposed surfaces. Dorsalmost parts of carpus and propodus armed with several strong spines.

Ornamentation of third left pereopod similar to that of D. venosus but with stout teeth on transverse ridges above lateral grooves. Propodal groove with short row of single teeth. Broad tubercles of lateral ridge with six worn, calcareous points proximally on propodus, diminishing to one or two on dactyl. Fringes of transverse ridges composed of stronger but less dense setae than in D. venosus. Dorsal and ventral fringes with a tuft of strong bristles at each transverse furrow. Bristles accompanied by row of stout teeth with corneous tips. Remaining pereopods less setose except distodorsally on dactyls. Tips of dactyls stout, corneous.

Sternal projection between coxae of third pereopods

directed anteriorly; shape more conical than cylindrical with a spinule surrounded by setae at tip. Fleishy abdominal flap near third pleopod elongate and setose. Telson produced on left side, feebly armed.

COLOR: Ground color of shield, eyestalks and eye scales salmon to flesh. Bands of deeper color appear on eyestalks and at each end. Peduncles of antennules and antennae with longitudinal stripes of Saturn red; same color appears in lateral stripes on antennal flagellum.

Ground color on merus and carpus of left chela vinaceous buff to flesh; venations on outer distolateral areas scarlet. Ground color of palmar face buff yellow; conical teeth rose purple to flesh with proximal teeth white, those on fingers cream buff. Setose fringes of teeth flame scarlet proximally to scarlet vermillion on fingers. Scarlet venations form network on most of light colored ventral surface. Short tufts of crimson bristles appear near fingertips.

Outer surface of minor cheliped with variegated coloring; orange buff proximally on merus to flesh distally and on carpus. Ground color on face of chela white except for salmon to coral band midway. Venations range from Saturn red proximally to carmine at fingertips, while bristles range from buff yellow on merus, through many banded with coral, crimson and yellow, to those in solid crimson tufts at fingertips.

Ground color on ornamented surface of merus of third left pereopod mainly chrome orange with teeth in ridges rose pink to almost white; setose fringes scarlet. Bristles of crests crimson with light yellow tips. Most teeth outlined by scarlet veining. Dactylar color similar but darker.

MEASUREMENTS (mm.): Shield, length 17, width 15.5; carapace 32.5; eyes 10; left chela, length 26, width 16, dactyl 14.5; right chela, length 20, width 10, dactyl 11.5; third left pereopod, basis-ischium 7.5, merus 15, carpus 13, propodus 14.5, dactyl 26.

REMARKS: The type female is estimated to be carrying 150,000 eyed eggs, each about 0.5 mm. in diameter. This colorful species and the other two members of the genus in the western Atlantic probably prefer shell, sand, or coral bottoms.

Dardanus petersi (A. Milne Edwards) n. comb.

Aniculus petersii A. Milne Edwards, 1880, p. 40.

Pagurus striatus var. petersii A. Milne Edwards and Bouvier, 1893, p. 162, pl. 11, figs. 24-35.

Pagurus arrosor var. petersi Moreira, 1903, p. 64; 1905, p. 132.

Pagurus arrosor Alcock, 1905, p. 168.

Dardanus arrosor var. petersi Gordan, 1956, p. 312.

Dardanus insignis Springer and Bullis, 1956, p. 16.

Not Dardanus insignis Saussure, 1858, p. 453, pl. 3, fig. 20.

MATERIAL EXAMINED: Sixty-two specimens from six general areas. The type specimen was not located. However, the large male, MCZ 12778, described by Milne Edwards and Bouvier (1893) was found.

Atlantic Coast: East of Cape Hatteras; 35° 05' N., 75° 09' W.; 100 fms.; June 16, 1957; "Combat" sta. 370, 1 male. East of Cape Lookout; 34° 54' N., 75° 25' W.; 75 fms.; June 17, 1957; "Combat" sta. 384; 1 male in a Murex shell. 34° 46' N., 75° 37' W.; 50 fms.; June 17, 1957; "Combat" sta. 385; 1 in a Phalium shell. Off Georgia; 31° 29' N., 79° 33' W.; 60 fms.; October 3, 1957; "Combat" sta. 512; 1 in a Phalium shell. Off St. Augustine; 29° 27' N., 80° 20' W.; 30 fms.; June 3, 1957; "Combat" sta. 350; 1 disintegrated specimen. Off Cape Canaveral, 28° 33' N., 80° 05' W.; 35 fms.; Jan. 18, 1940; "Pelican" sta. 170-2; 1 female. Off Fort Pierce; 27° 29' N., 78° 58' W.; 200 fms.; Feb. 27, 1957; "Combat" sta. 236; 1 juv. male. Straits of Florida; 25° 13' N., 80° 10' W.; 40-50 fms.; July 26, 1957; "Combat" sta. 455; 1 male. Santaren Channel, 24° 04' N., 79° 15' W.; 250 fms.; July 24, 1957; "Combat" sta. 448; 1 male.

Gulf of Mexico: Off Mississippi Delta; 29° 02' N., 88° 50' W.; 89 fms.; Feb. 4, 1938; "Pelican" sta. 10, 1 female. Western Florida; 29° 47' N., 86° 51' W.; 96 fms.;

Mar. 5, 1939; "Pelican" sta. 144-2; 1 ovig. female. 29° 16' N., 85° 32' W.; 26 fms.; Feb. 7, 1885; "Albatross" sta. 2369; 2 juveniles.

Tortugas and Florida Keys: Specimens collected by W. L. Schmitt unless otherwise noted. South of Tortugas: 60 fms.; June 30, 1932; 1 in a Phalium shell; 1 female. 55-58 fms.; July 28, 1932; 1 male. 39 fms.; June 26, 1932; 1 ovig. female. 40 fms.; June 17, 1932; 1 female. 1931; Paul Bartsch; 8 males, 4 ovig. females (carapace length of females 16-22 mm., of males 10-67 mm.). 40-45 fms.; Aug. 20, 1931; Paul Bartsch; 2 males; 2 females (1 ovig.). June 17, 1932; 2 ovig. females. 40 fms.; Aug. 4, 1931; 1 male, 1 female. 60 fms., July 22, 1931, 3 males, 3 females, 1 in shell. 35 fms.; Aug. 14, 1933; H. H. Darby; 1 juv. 45 fms.; June 10, 1925; 1 in a Phalium shell. 60 fms.; July 22, 1931; 1 male, 1 in shell of Xiphosura. 40 fms.; Aug. 4, 1931; 1 in Murex shell covered by sponge. 80 fms.; July 13, 1930; 1 in shell of Strombus, 1 male in shell of Busycon. Off Miami and Keys: Miami; 30 fms.; May, 1912; J. B. Henderson; 2 juv. females. Key West; 65 fms.; J. B. Henderson; 1 male. 24° 26' N., 81° 48' W.; 37 fms.; Jan. 15, 1885; "Albatross" sta. 2317; 1 male in bryozoan Hippoporidra edax Busk.

Campeche Bank: 23° 20' N., 89° 16' W.; 84 fms.; Feb. 18, 1877; "Blake" sta. 36, 1 large male, MCZ 12778.

Off Surinam: 07° 38' N., 54° 11' W.; 75 fms.; Nov. 8,

1957; "Oregon" sta. 2015, 1 male. $07^{\circ} 30' N.$, $54^{\circ} 16' W.$; 125 fms.; Nov. 8, 1957; "Oregon" sta. 2013; 1 male. $07^{\circ} 18' N.$, $53^{\circ} 32' W.$; 100 fms.; Nov. 8, 1957; "Oregon" sta. 2021, 2 males.

Off Northern Brazil: $04^{\circ} 05' N.$, $50^{\circ} 27' W.$; 50 fms.; Nov. 13, 1957; "Oregon" sta. 2051; 1 male.

RANGE: Cape Hatteras, N.C., to Brazil; 26 to 250 fms. In the Caribbean reported only from Barbados.

DIAGNOSIS: Large, colorful species. Pereiopods with overlapping transverse ridges armed with spinules and fringed with setae. Chelae not markedly unequal.

DESCRIPTION: Carapace flattened. Lateral teeth rounded. Apical tuft of setae on each eyestalk small, dense. Eye scales separated at bases, occasionally approximated at tips. Antennular peduncle exceeding eyes by as much as half of terminal segment in adults. Antennal peduncle exceeding eyes only in adults. Acicle short, equaling eyes in large adults, scarcely reaching cornea in smaller specimens; feebly armed with several denticles.

Left cheliped armed with strong calcareous spines on inner ventral angle of merus, with sharp, corneous-tipped spines on dorsalmost areas of merus, carpus and chela. Face of carpus and chela covered with narrow, overlapping plates. Latter with corneous spinules and even fringes of fine setae along all margins. Fingers present tufts of strong setae. Right cheliped similar to left, not markedly

smaller.

Propodus and dactyl of third pereopod on left larger than in right member; outer surfaces with transverse ridges resembling those of chelae. Dorsal margin of dactyl with a row of spinules and numerous strong setae.

COLOR: Specimen from "Combat" sta. 455 after one year in formalin. Scarlet occurs as a narrow line at bases of eye scales and in three bands around each eyestalk. Latter with apical tuft of crimson setae. Shingle-like ridges of chelae geranium red interspersed with yellow vermiculations proximally, solid and more intense distally. Setae in fine fringe along each scale change from yellow at base, then red, to white at tips. Corneous spinules of ridges light yellow. Walking legs similarly ornamented and colored. Large specimens from Dry Tortugas darker in color.

MEASUREMENTS (mm.): Large male taken off Surinam. Shield, length 22, width 20.5; carapace 43; eyes 12; left chela, length 39, width 22, dactyl 21.5; left chela 34.5; third left pereopod, basis-ischium 12, merus 23, carpus 19.5, propodus 22.5, dactyl 44.

Dardanus venosus (H. Milne Edwards)

Pagurus venosus H. Milne Edwards, 1848, p. 61.

Pagurus insignis Saussure, 1858, p. 453, pl. 3, fig. 20.

--Martens, 1872, p. 119. --Alcock, 1905, p. 170. Bouvier, 1918, p. 6.

Petrochirus insignis Rathbun, 1900, p. 144.

Pagurias insignis Benedict, 1900, p. 141.

Dardanus insignis Gordan, 1956, p. 314.

Dardanus venosus Verrill, 1908, p. 452. --Gordan, 1956, p. 316.

MATERIAL EXAMINED: Twenty-two specimens from seven localities.

Off South Carolina: 32° 51' N., 78° 59' W.; 14 fms.; Feb. 12, 1940; "Pelican" sta. 182-23; 1 in shell.

Off Georgia: 31° 28' N., 79° 46' W.; 25 fms.; Feb. 1, 1940; "Pelican" sta. 179-4; 1 female in a Phalium shell.

Off St. Augustine: 30° 24' N., 80° 20' W.; fms.; June 3, 1957; "Combat" sta. 353; 1 ovig. female in Poly-nices shell.

Tortugas: Fort Jefferson; June 25, 1925; W. L. Schmitt; 1 male. Fort Jefferson moat; Aug. 11, 1924; W. L. Schmitt; 1 male from fish trap set in eel grass. Aug. 11, 1930; W. L. Schmitt; 1 in Strombus shell.

Haiti: Muertas Is.; Feb., 1929; Poole and Perrygo; 1 male.

British Guiana: 07° 55' N., 57° 30' W.; 45 fms.; Nov. 5, 1957; "Oregon" sta. 2000; 1 in sponge.

Northern Brazil: 04° 02' N., 50° 33' W.; 38 fms.; Nov. 13, 1957; "Oregon" sta. 2049; 1 male, 3 females. 04° 04' N., 50° 32' W.; 40 fms.; Nov. 13, 1957; "Oregon" sta. 2050; 3 females from Natica shells, 2 males and 2 females

(1 ovig.) from Fusinus shells. 04° 05' N., 50° 27' W.; 50 fms.; Nov. 13, 1957; "Oregon" sta. 2051; 2 males. 02° 31' N., 48° 48' W.; 55-60 fms.; Nov. 15, 1957; 1 large male in Fasciolaria shell.

RANGE: Bermuda and South Carolina south to mouth of Amazon River; littoral to 55 fms.

DIAGNOSIS: Colorful species not attaining as large a size as D. petersi. Major cheliped much larger than minor. Chela faced with oval, scalloped, plate-like tubercles lacking spines. Propodus and dactyl of third left pereopod with a broad, deep groove dorsal to a prominent outer ridge.

DESCRIPTION: Apical tuft of setae on eyestalk rising from a transverse line and forming a median comb over the cornea. Antennular peduncle equaling eyes in young, considerably exceeding in adults; length of antennal peduncle in relation to eyes also varying with age, usually subequal.

Left cheliped four times as heavy as right by weight. Basis-ischium and merus with rounded, calcareous spines on inner ventral margin. Merus with two sharp spines on disto-dorsal margin. Carpus with five sharp spines on inner dorsal margin, others more laterally. Face of chela covered with tubercles which present one to six raised points distally; points appear translucent at tips. Tubercles with more than one point appear scalloped. Fan of plumose setae borders each tubercle distally. Cutting edges with six

calcareous teeth on dactyl, eight on pollex.

Right cheliped small, chela lacking scalloped tubercles. Carpus, propodus, and dactyl with short, stout spines on dorsalmost surface. Scattered setae long, bristle-like.

Propodus and dactyl of third right pereopod with strong outer ridge situated more ventrally on dactyl than on propodus. Deep groove seen above this ridge. Dorsal and ventral margins appear crested. Transverse ridges on propodus and plates on dactyl scalloped as on tubercles of major chela; ornamentation absent in grooves except for central row of minute tubercles. Other walking legs armed with spinules on dorsal angles of dactyl; latter also presents a fine groove on outer surface.

Protuberance between third pair of coxae a narrow spike capped by a tuft of setae, as in D. petersi.

COLOR: Specimen from "Combat" sta. 353, in formalin for one year. Shield rose purple with median crimson spot behind tuft of setae on gastric region. Eyestalks with distodorsal crimson area behind apical tuft fading to rose purple proximally and on scales. Longitudinal stripes of antennular and antennal peduncles and flagellum of latter orange-buff.

Scalloped tubercles of right chela campanula blue with fringes of buff-yellow setae. Crimson lines appear on larger tubercles, between teeth of cutting edges and as a network on white ventral part of fingers. Minor chela with

slightly raised areas and some spines campanula blue on palm, fading to white on fingers; each area outlined by scarlet lines and supporting one or more carmine bristles. Background on merus and carpus mainly flesh color. Transverse ridges on propodus and dactyl of third left pereopod also campanula blue with a few crimson lines; setose fringes salmon. Dorsal and ventral crests with numerous carmine bristles and dense pilose setae. All walking legs with a crimson band midway around each merus and carpus; background vinaceous.

MEASUREMENTS (mm.): Male from "Oregon" sta. 2051. Shield, length 12.3, width 11.0 carapace 26.4; eyes 8.4; left chela, length 22.5, width 13.9, dactyl 12.5; right chela, length 13.5, width 6.5, dactyl 8.4; third right leg, basis-ischium 7.5, merus 12.0, carpus 10.0, propodus 12.0, dactyl 20.0.

REMARKS: The ovigerous female from "Combat" sta. 353 probably carries at least 50,000 eggs, each about 0.3 mm. in diameter.

Genus Isocheles Stimpson

Isocheles wurdemanni Stimpson

Isocheles wurdemanni Stimpson, 1862, p. 85. --Mora, 1905, p. 143. --Behre, 1950, p. 22. --Wass, 1955, p. 151. --Gordan, 1956, p. 319.

MATERIAL EXAMINED: Seven specimens from two areas.

Texas: Willis G. Hewatt; Offat Bayou, Galveston;
Apr. 23, 1941; 3 males, 3 females.

Florida: Alligator Point, Franklin Co., Aug., 1952,
1 male in an Oliva shell.

RANGE: Northern Gulf of Mexico (Florida, Louisiana,
and Texas) to Venezuela and Sao Paulo, Brazil (Moreira,
1905). Not known from any Caribbean islands.

DIAGNOSIS: Carapace wedge-shaped, much broader posteriorly. Eyes narrow, cornea small. Eye scales contiguous. Chelipeds small, left slightly larger than right.

DESCRIPTION: Shield as wide as long, covered with setose tubercles except in center of gastric region; setae long and stiff. Postcervical carapace and posterior part of gill covers obscured by dense coat of pilose hair. Gill covers composed anteriorly of many calcified plates. Rostrum and lateral teeth of shield each marked by a denticle, not produced.

Eyes narrowed distally, cornea small, sparsely setose. Eye scales approximated medially, finely dentate on outer distal margin. Antennular peduncle exceeding eyes by a third of terminal segment. Antennal peduncle at least equaling eyes; basal segment granular on distal margin; second segment unarmed on inner angle, outer projection only a short tooth. Acicle heavy, short, feebly armed, pilose on inner margin, setose dorsally. Flagellum heavy

at base, shorter than carapace; a pair of strong setae directed distoventrally at each articulation.

Chelipeds subequal, left slightly larger. Merus of cheliped spinulose above, pilose on inner dorsal margin, otherwise setose. Carpus with inner margin of calcareous spines bordered laterally by shallow trough, with remaining dorsal surface bearing calcareous denticles. Hand and fingers faced with calcareous teeth which are broadest distally, spinous on inner and outer margins. Corneous finger tips sharper and longer than usual.

Walking legs with abundant calcareous spinules, denticles and granules, mostly well marked rows except dorsally on propodus. Fourth pereopods chelate with rasp of minute scales covering most of outer and marginal surfaces of pollex. Fifth pair with long, narrow propodus bearing small rasp at base of pollex; rasp extends to finger tips as a row of scales on inner margin of each. Under surfaces of first three segments of pereopods exhibit numerous friction pads.

Pleopods of female with thick covering of pilose hairs to which are attached, on the first three pleopods, about 10,000 eggs, each about 0.3 mm. in diameter. External ramus of male pleopods very minute. Telson asymmetrical, without a median cleft; feebly armed at extremity.

MEASUREMENTS (mm.): (Male from Texas coast) Shield length 8.0, width 8.2; carapace 16.5; eyes 5.3; left chela,

length 13.0, width 7.5, dactyl 7.3; third right pereopod, basis-ischium 4.3, merus 7.0; carpus 6.3, propodus 10.0, dactyl 16.0.

Genus Paguristes Dana

Shield broadened anteriorly, more or less setose laterally and in shallow grooves. Eyes slender, usually shorter than, or equal to, anterior width of shield. Cornea dilated little or not at all. Eye scales well separated; terminating in a single spine in most species, in up to four in a few. Peduncles of antennules and antennae variable in length, usually well armed and setose. Antennal flagellum varying greatly in length and in amount of setae present.

Chelipeds usually equal, chela articulating obliquely with carpus. Walking legs usually exceeding chelipeds; dactyl longer than propodus. Fourth pereopods not chelate; narrow rasp covering most of outer ventral angle of propodus. Male with a pair of gonopods on each of first two abdominal segments, followed by three unpaired pleopods. Females with a single pair of gonopods and four unpaired pleopods. A brood pouch composed of an abdominal flap rises immediately behind third pleopod; rudimentary in a few species. Telson usually asymmetric and armed with fine spinules.

Gill pairs 13, lamellae phyllobranchiate, usually cleft; oval in a few species.

In striking contrast to most of the species found on the west coast of Africa, in which the females have a genital opening only on the coxa of the third left pereopod (Forest, 1954), all of the western Atlantic forms have openings on both sides in the female. While one species from the Caribbean region is apparently closely related to a Mediterranean species, the principal affinities seem to be with species from the opposite side of the continent.

Key to Species

1. Anterior appendages presenting abundant plumose hair on head appendages and pereopods.....2.
Anterior appendages with simple setae or none.....4.
2. Shield over $1\frac{1}{2}$ times as long as wide. One of smallest species in genus.....anomalus.
Shield less than $1\frac{1}{2}$ times as long as wide.....3.
3. Chelipeds not obscured by pilose hair on carpi and chelae. A strong dorsal ridge on carpus.....hewatti.
Chelipeds obscured by fine pilose hair on dorsal surfaces. Carpus without a strong dorsal ridge...tortugae.
4. Antennal flagella with two rows of long setae forming a wide ventral angle.....acuticornis.
Flagella without above arrangement of setae.....5.
5. Antennal flagella much longer than carapace.....6.
Antennal flagella but little longer than carapace....10.
6. Antennae equaling pereopods.....7.
Antennae shorter than pereopods.....9.
7. Telson symmetrical; chelipeds well armed.....spinipes.

- Telson asymmetrical; chelipeds armed only with denticles or short spines.....8.
8. Dactyl of third right pereopod exceeding carapace. Rostrum obsolescent.....moorei.
Dactyl of third right pereopod shorter than carapace. Rostrum present.....triangulatus.
9. Eye scales with a single terminal spinule.....lymani.
Eye scales usually with four terminal spinules.....savi.
10. Chelae nude, unarmed, with a long dorsal depression.....cadenati.
Chela not as above.....11.
11. Chelae with scale-like covering dorsally, unarmed.....depressus.
Chelae not as above.....12.
12. Body extremely flattened, deep water form.....planatus.
Body less depressed, species from lesser depths.....13.
13. Chelipeds over $1\frac{1}{2}$ times as long as wide.....foresti.
Chelipeds less than $1\frac{1}{2}$ times as long as wide.....14.
14. Anterolateral angles of shield equal to recessed areas in margin behind eyestalks, stalks a solid color.....sericeus.
Anterolateral angles of shield not reaching level of postocular recessions; eyestalks spotted.....15.
15. First three pereopods with numerous corneous-tipped spines on chelae and dactyls and a sparse amount of setae. Large species.....grayi.
Corneous spines on pereopods less numerous; setae generally obscuring bases of spines. Medium-sized species.....puncticeps.

Paguristes acuticornis n. sp.

MATERIAL EXAMINED: Holotype male; off Surinam; 06° 48' N., 55° 12' W.; 25 fms., Sept. 8, 1958; "Oregon" sta. 2284. Paratype, male; found with type of Paguristes moorei Benedict, but almost certainly not from same station, since moorei was taken by the "Atlantis" only at depths between 175 and 230 fms.; probably from Puerto Rico. Dry Tortugas; 45 fms.; 1934; H. H. Darby; 1 male paratype.

RANGE: Dry Tortugas to Surinam; 25 to 45 fms.

DIAGNOSIS: Small species with eyestalks narrowed distally; cornea bulbous, pointed at tips. Antennae short, with two rows of long hairs, as in Isocheles.

DESCRIPTION: Shield with narrow margin along entire front; lateral teeth tipped with a denticle, exceeding rostrum. Rounded elevations appear posteromedial to lateral teeth. Entire body and nearly all appendages moderately covered with fine, pilose hairs.

Eyes equaling shield, swollen basally; cornea long, bulbous. Eye scales small, with single terminal spine. Antennular peduncles exceed eyes by a third of terminal segment. Antennal peduncle equaling eyes; a minute spinule on inner angle, spine on short, outer angle. Acicle triangular, blade-like; one or two spinules on inner margin, tip not spined. Flagellum longer than carapace, with two

rows of long, thin setae forming a ventral angle of about 120°. Segments of flagellum long, numbering 14 or less.

Chelipeds short, stout, with strong spines on inner dorsal margins of carpus and propodus. Inner ventral angle of merus armed with five denticles, outer angle with a few low denticles and a marginal spinule; spinule on distodorsal margin of merus preceded by a sharp spine projecting over separating groove. Carpus with four or five spines on both inner and outer dorsal margins; a distal spine at hinge joint. Inner dorsal margin of hand with five large spines; four rows of spinules and denticles on dorsal surface. Long white setae rise from bases of denticles and spines. Fingers gape except at tips. Dactyl lacks corneous cutting edge; both fingers with edges of low, separated teeth. Corneous tips minute.

Dorsal surfaces of second pereopods armed with four spines on carpi, two to five on propodi; third pair armed only with a small spinule on distodorsal margins of carpi. Propodus of fourth pereopods with a small triangular rasp on distal two-thirds of lower edge; dactyl without a rasp; fifth pereopod with a rasp on distal two-fifths of hand. First pair of gonopods narrowly separated; second pair long, with terminal segments exceeding first pair. Basal segment of left uropod unarmed. Telson asymmetric, terminal lobe on left armed with two or three spinules.

COLOR: Specimen from "Oregon" sta. 2284 after four months in formalin. Shield mottled with orange and red; a median red spot on rostrum. Eyestalks flecked with red. Cornea with black pigmented center touching surface only at extreme tip. Antennular flagellum maroon below; antennal flagellum translucent, with a narrow maroon band just behind distal ring of setae on each segment. Chelae with red vein, faintly marked on proximal dorsal surface, well marked on proximal and inner ventral surface. Walking legs with proximal and distal red bands on meri, carpi, and propodi; only a proximal band on dactyls.

MEASUREMENTS (mm.): Shield, length 2.5, width 2.5; carapace 4.5; eyes 2.5; chela, length 4.0, width 1.5, dactyl 2.5; third leg, basis-ischium 1.2, merus 2.5, carpus 1.8, propodus 3.0, dactyl 4.2.

Paguristes anomalus Bouvier

Paguristes anomalus Bouvier, 1918, p. 6, 5 figs.

--Gordan, 1956, p. 321.

MATERIAL EXAMINED: Five specimens from Key West, Fla.; Aug. 20, 1958; E. L. Pierce; 3 males, 2 females.

RANGE: Florida Keys and Cuba; littoral.

DIAGNOSIS: Shield nearly $1\frac{1}{2}$ times as long as wide. Eyes much shorter than width of shield; eyestalk more swollen at base than at cornea. Pereiopod and shield rose

colored. A small species.

DESCRIPTION: Shield two-thirds as wide as long, nude and evenly convex. Frontal margin thickened between elongate rostrum and lateral teeth. Eyes short, swollen basally, slightly so at cornea. Eye scales separated by rostrum, bifid at tip. Antennular peduncles not exceeding eyes. Antennal peduncles reaching cornea; flagellum short, seldom reaching chelae; each articulation with a circle of minute setae.

Chelipeds short, laterally compressed. Merus and ischium with a row of even denticles on inner ventral margin. Carpus and manus armed with corneous-tipped spinules on inner dorsal margin. Dorsal surfaces of carpus and chela quite flat, with an outer margin of dense, pilose hair. Granular dorsal surface obscured by an even, fine pubescence. Cutting edges of fingers uneven, with corneous edges near tips.

Walking legs short, compressed in all segments; dorsal and ventral margins carry a dense cover of fine, plumose hair. Dactyls with a few corneous spinules ventrally; claws strong. Rasp on propodus of fourth pereopods three scales wide. Only two or three scales appear on dactyl next to short claw. Fifth pereopods with rasp covering distal third of chela. First pair of gonopods heavy, moderately separated. Median cleft of telson shallow; margin supporting sparse setae and, laterally, a few denticles.

MEASUREMENTS (mm.): Male from Key West. Shield, length 3.2, width 2.3; carapace 4.8; eyes 1.8; chela, length 2.7, width 1.3, dactyl 1.7; third right pereopod, basis-ischium 1.0, merus 2.1, carpus 1.7, propodus 2.0, dactyl 2.3.

Paguristes cadenati Forest

Paguristes cadenati Forest, 1954, p. 353, figs. 1-3.

RANGE: Known only from holotype male collected at Fort-de-France, Martinique.

DIAGNOSIS: (after Forest) Shield a little longer than posterior part of carapace. Hepatic regions of shield with one large tooth and two smaller ones. Rostrum elongated, with a small point at tip. Eystalks a little less than twice as long as distance between lateral teeth. Eye scales simple, acuminate. Antennular peduncles reaching base of cornea of right eye; those of antennae shorter. Acicles long, nearly reaching base of flagellum. latter shorter than carapace.

Chelipeds subequal. Carpus with a large blunt tooth subdistally and deeply excavated ventrally. Propodus twice as long as broad; a large depression in palm. Dactyl less than half as long as hand, cutting edge with a large tooth near base. Fingers spooned at tips, gaping proximally when closed. Carpus and chela covered with microscopic corneous

tubercles which are a little larger on carinae limiting depressions of carpus and palm.

Walking legs armed only with distodorsal tooth on carpus, corneous spinules on ventral angle of dactyl.

Male pleopods similar to those of Paguristes oculatus (Fabricius).

Gill pairs eleven, each lamella deeply emarginate.

Paguristes depressus Stimpson

Paguristes depressus Stimpson, 1859, p. 87. --Gordan, 1956, p. 321.

MATERIAL EXAMINED: Eight specimens from Puerto Rico and the Guianas.

Puerto Rico: Mayaguez Harbor; Jan. 19, 1899; "Fish Hawk"; 1 male, 1 female. La Pena, Mayaguez Harbor; Nov. 9, 1946; W. G. Hewatt; 1 male. Off Point Melones; 7½ fms.; Jan. 25, 1899; "Fish Hawk" sta. 6072; 1 juv. male. Between Ratones and Caribe Ids. off Tallaboa; July 8, 1915; R. C. Osburn; 1 juv. female. Mayaguez; Jan. 19, 1899; "Fish Hawk"; 1 juv. female.

British Guiana: 07° 45' N., 57° 34' W.; 30-35 fms.; Aug. 31, 1958; "Oregon" sta. 2248; 1 juv. male.

French Guiana: Labeled "Oregon" 2320; undoubtedly an error since that station was at a depth of 200 fms. More likely from sta. 2321a or b, both at 06° 52' N., 53° 18' W.;

34 fms.; Sept. 14, 1958; 1 small male.

RANGE: Puerto Rico to Surinam; to 34 fms.

DIAGNOSIS: Body and chelipeds compressed vertically. Eyes subequal to shield. Faces of chelae covered with scale-like tubercles which are tufted but unarmed.

DESCRIPTION: Shield flat, margin thickened on either side of rostrum to lateral teeth and more indented there than at anterolateral angles. Rostrum slender, exceeding lateral teeth. Posterior part of carapace twice as wide as shield.

Eyes long, little shorter than shield. Eye scales separated, simple, with one or two denticles at tip. antennular peduncles subequal to eyes. Antennal peduncles short, reaching about two-thirds length of eye. Second segment of antennal peduncle with a low, conical swelling at center, a minute spinule on inner angle; outer projection bifid into two spinules. Acicle short, reaching midway on eye; with three spinules on inner proximal half, three or four on outer distal half. Flagellum short, almost nude; length near that of carapace.

Chelipeds flattened; left chela normally broader than right. Dorsal angle of merus broadened distally, with a smooth area along distal margin bordered posteriorly by a low escarpment. Dorsal surface of hand covered with scale-like tubercles, each with a minute, pubescent tuft. Carpus and palm with stout, short spines on inner dorsal edge.

Outer margin of hand increasingly sharp distally. Fingers meeting throughout.

First walking legs with carpus spined on inner and distodorsal margins. Propodi and dactyls of both walking legs with a serrate or scalloped edge dorsally; a dense brush of reddish-yellow setae rises from dorsal margin of dactyls. Propodus of fourth pereiopods with triangular rasp on distal half of ventral margin; dactyl with row of four corneous scales behind stout tip. Fifth pereiopods with large rasp covering distal three-fourths of hand, including most of dactyl.

Gonopods of male stout, well separated basally. Unpaired pleopods large, with dense fringe of pilose hair; outer ramus obsolescent. Terminal abdominal appendages not unusually asymmetrical. Three or four spinules posteriorly on distal margin of base of left uropod. Telson narrow, margins of lobes armed with even tubercles.

COLOR: Carapace and antennae pink, mottled with coral. Pereiopods similarly colored, with mottling tending to occur in broad bands on carpi and propodi of walking legs; abdomen suffused with apricot and salmon. Eye stalks and antennular peduncles solid orange chrome. Cornea black.

MEASUREMENTS (mm.): Male collected by W. G. Hewatt. Shield, length 12.0, width 10.5; carapace 21.0; eyes 11.2; chela, length 14.5, width 11.0; third pereiopod, basis-ischium 6.7, merus 10.0, carpus 8.0, propodus 9.0, dactyl

17.2.

REMARKS: This species is closely related to Paguristes digneti Bouvier and Paguristes sanguinimanus Glassell but differs from these Pacific coast species chiefly in the ornamentation of the chelae, the Pacific species presenting spinulose tubercles rather than tufted ones.

Paguristes foresti n. sp.

MATERIAL EXAMINED: Holotype male; Tortugas; 64 feet; June 26, 1931; W. L. Schmitt.

RANGE: Known only from type.

DIAGNOSIS: Chelipeds flattened above, finely pubescent; margined with corneous-tipped denticles. Medium-sized species similar to P. anomalus Bouvier but several times larger.

DESCRIPTION: Shield evenly convex; some fine pubescence laterally and anteriorly. Rostrum triangular, covering ophthalmic ring. Cardiac plate narrow, with calcified, furrowed areas on either side. Eyes shorter than shield, not dilated distally; stalks porcellanous but supporting pilose setae at bases. Eye scales short, forming a single spine. Antennular peduncles a little longer than those of antennae but not reaching cornea. Antennal flagella shorter than chelipeds; articles short, with minute setae at each joint.

Chelipeds flattened dorsally on carpus and chela; these

segments feebly armed with corneous spinules on both margins. Spinules scattered, not in distinct rows; sparse on distal part of palm. Margins raised proximally on fingers. Latter strong, closing completely.

Walking legs strong, exceeding chelipeds. Dorsal angles of last three segments of first pair armed with minute corneous spinules. Second pair with a spinule at distodorsal angle of carpus. Setae mainly pilose except on upper and lower angles of dactyls. Claws short, dark; flanked by dark setae.

Fourth pereopods stout, flattened. Propodal rasp a narrow triangle on distal two-thirds of ventral margin; four scales on dactyl. Chelae of fifth pereopods with rasp on distal three-fifths. Telson asymmetrical, unarmed, lacking a median indentation.

COLOR: After 28 years in alcohol a considerable amount of light red color still persists on first three pairs of pereopods as irregular blotches surrounding small white spots.

MEASUREMENTS (mm.): Shield, length 6.0; width 4.8; carapace 10.5; eyes 5.2; chela, length 6.8, width 3.2, dactyl 4.0; third right pereopod, basis-ischium 2.9, merus 5.1, carpus 4.0, propodus 5.0, dactyl 6.9.

REMARKS: While this species somewhat resembles the much smaller P. anomalus, it is most closely related to P. oculatus (Fabricus). Both have short antennae with a pilose

tuft at the tip. In oculatus, even denticles with blunt spines cover the faces of the chelae and the left chela is a little larger than the right. The gonopods of the proposed new species are closer to those of oculatus than to any other species.

This species is named in honor of Jacques Forest, the foremost student of this genus of pagurids.

Paguristes hewatti n. sp.

MATERIAL EXAMINED: Holotype male, USNM 97658, paratype males, USNM 97659 and one other, Heald Bank, Sabine, Texas, 1955, Willis G. Hewatt.

RANGE: Known only from Heald Bank.

DIAGNOSIS: Chelipeds heavy. Dorsal surfaces of carpi and chelae not obscured by pilose hair. Large distal protuberances on carpus of cheliped just behind dorsal hinge joint.

DESCRIPTION: Closely related to Paguristes tortugae Schmitt. Differs from that species in the following points: Reaches larger size. Chelipeds lack dense pubescence on dorsal surfaces. Scale-like tubercles of carpus and chela clearly visible; each tubercle with a distal fringe of minute hairs. Median dorsal ridge on carpus terminating in a prominent elevation. Horny finger tips and flanking tufts of setae darker than in tortugae.

Eye scales shorter, with only two distal spinules.

MEASUREMENTS (mm.): Shield, length 6.3, width 5.0; carapace 10.5, eyes 4.0; chela, length 6.5, width 3.4, dactyl 4.3; third pereopod, basis-ischium 2.5, merus 4.4, carpus 3.6, propodus 4.0, dactyl 5.0.

Paguristes gravi Benedict

Paguristes gravi Benedict, 1901, p. 146, pl. 5, fig. 1.
--Gordan, 1956, p. 322.

Pagurus villosus Terralbas, 1917, p. 601. Not Pagurus villosus Nicolet, 1849, p. 188.

MATERIAL EXAMINED: Fifteen specimens from five areas.

Types: Puerto Rico, San Juan, San Antonio Bridge;
G. M. Gray; 2 males, 1 large female.

Florida: Tortugas; July-Aug., 1930; W. L. Schmitt; 1 large female; Long Key Shoal, eel grass; 3-4 feet; Aug. 7, 1924; W. L. Schmitt, 2 males; rocks below Loggerhead Key lighthouse; July 24, 1930; 1 female in shell of Strombus gigas Linnaeus; Bush Key Reef; July, 1930; W. L. Schmitt; 1 male, carapace length 35 mm. Long Reef, Monroe Co.; Apr. 19, 1958; G. Shinn, 1 male.

Haiti: Reef east of Tierra Baja Road, Tortugas Ids.; $\frac{1}{2}$ fm.; Mar. 21, 1937; W. L. Schmitt; 2 juv. females.

British Honduras: P. W. Shufeldt, 3 males.

Barbados: Antigua, Pillars of Hercules; Jan. 7, 1918; 1 male.

RANGE: Florida Keys to Barbados; littoral.

REMARKS: This species, largest of the western Atlantic Paguristes, while attaining a size twice as large as does P. puncticeps, nevertheless is so similar to the latter species that alcoholic specimens can only be determined by the much smaller amount of setae present and the much greater number of corneous-tipped spinules on the chelipeds and walking legs. The rostrum varies from a blunt triangle equaling the lateral teeth to a narrow point covering the ophthalmic somite. The transverse sulcus behind the rostrum is straight and the median sulcus extending back from it is deeper. No difference is evident in the male gonopods.

COLOR: Specimen from Monroe Co. after two months in formalin. Wine ground color on carapace and appendages, thickly spotted with white. Pattern seemingly differs most in eyestalks which have many larger white spots and only a few small ones; dark ground color extends almost to corneas.

MEASUREMENTS (mm.): Large female; shield, length 19, width 16; carapace 30; eyes 13. Small male; shield, length 8.5 (rostrum rudimentary), width 7.5; carapace 13.5; eyes 6.5.

REMARKS: It is possible that the Pagurus villosus of Torralbas could be Paguristes puncticeps. However, most of the evidence points to its being the present species; gravi seems to retain color markings better in preservative and it attains a much larger size.

Paguristes lymani Milne Edwards and Bouvier

Paguristes lymani Milne Edwards and Bouvier, 1893,
p. 49, pl. 4, figs. 13-22. --Gordan, 1956, p. 322.

MATERIAL EXAMINED: Twenty-seven specimens from eight localities.

North Carolina: 34° 05' N., 76° 10' W.; 82-100 fms.;
Feb. 27, 1940; "Pelican" sta. 187-4; 1 male, 1 female, in
shells of Phalium; carapace length of male 17.7 mm.

Off St. Augustine: 29° 55' N., 80° 10' W.; 180-220
fms.; Dec. 5, 1956; "Combat" sta. 185-187; 1 female.

Straits of Florida: Miami Beach; 72 fms.; Aug. 25,
1951; F. M. Bayer; 1 juv. male. 24° 21' N., 81° 52' W.;
Feb. 19, 1902; "Fish Hawk" sta. 7282; 2 males, 1 ovig.
female. Following specimens collected by J. B. Henderson
at Key West in 1916: Western Dry Rocks; 65-90 fms.; 3
males, 3 females (1 ovig.); South of Key West on edge of
Pourtalles Plateau; 2 in shells of Scaphella dohrni (Sowerby);
Sambo Key; 115 fms.; 1 female. 24° 13' N.; 81° 42' W.; 300
fms.; July 21, 1957; "Combat" sta. 436; 1 male. Sand Key;
15 fms.; March 29, 1878; "Blake"; 1 male which, although not
shelved with the types, is evidently the holotype.

West of Rosalind Bank: 16° 39' N., 82° 29' W.; 225
fms.; Aug. 21, 1957; "Oregon" sta. 1870; 1 female. 16° 41'
N., 81° 02' W.; 250 fms.; Aug. 23, 1957; "Oregon" sta. 1888;
2 males, 1 ovig. female.

Guadeloupe: 15 fms.; "Blake" sta. 166; 1 female.

Off mouth of Orinoco: 09° 45' N., 59° 45' W.; 200 fms.; Nov. 4, 1957; "Oregon" sta. 1989; 1 male, 1 ovig. female.

Off Surinam: 07° 30' N., 54° 16' W.; 125 fms.; Nov. 8, 1957; "Oregon" sta. 2013; 1 male.

Off mouth of Amazon: 01° 45' N., 46° 46' W.; 275 fms.; "Oregon" sta. 2084; 1 female.

RANGE: North Carolina to mouth of Amazon; 15-878 fms. (Milne Edwards and Bouvier, 1893), otherwise 65-300 fms. This species was not taken in the "Atlantis" collections around Cuba or by W. L. Schmitt in his extensive Tortugas collecting; nor has it been taken in any other part of the Gulf of Mexico.

DIAGNOSIS: Eyes about two-thirds as long as shield, cornea not swollen. Many lightly calcified plates formed on gill cover, somewhat as in Isocheles. Straw colored setae abundant on pereopods, particularly on walking legs. Unpaired pleopods of male uniramous.

DESCRIPTION: Shield with margin across entire front; rostrum not exceeding lateral teeth. Only sizeable depression of carapace lies just behind rostrum. Numerous punctae with short setae on lateral regions. Cardiac plate narrowed to a point posteriorly, partly bordered by a more calcified plate on each side.

Eyes small, slightly swollen at each end. Stalks with a dorsomedian line of setae. Eye scales small, with a minute apical spinule. Extended antennular peduncle has terminal segment beginning at level of base of cornea. Antennal peduncle not reaching cornea; armament of acicle concealed by long setae which extend over eyestalk and exceed cornea. Antennal flagellum short, reaching dactyl of chela; several fine setae at each joint.

Chelipeds armed on inner dorsal margins, usually with five spines on carpus, four on palm. Face of chela appears porcellaneous, with many corneous-tipped denticles and more numerous tufts of setae. Fingers meet only along corneous cutting edges of tips. Calcareous teeth of gape edges strong. Dactyl covered with small corneous spots medially which apparently act as friction points.

Walking legs strong, the first with a few dorsal spinules on carpus and propodus. Dense setae on dorsal and ventral margins. Dactyls heavy, claws weak. Rasp of fourth pereopods four scales wide distally; only four corneous scales on dactyl. Chela of fifth with rasp on distal two-fifths.

First pair of male gonopods strong, separated by a space equal to terminal segment of one member. Unpaired male pleopods uniramous. Female carries about 300 eggs 1.0 mm. in diameter. Base of left uropod armed with two or more denticles posteriorly. Terminal lobes of telson armed with

small corneous-tipped denticles.

COLOR: Specimen from "Oregon" sta. 1989 in formalin. Rose in varying intensity on carapace; on head appendages except dorsally on eyestalks; and on pereopods, with color fading to white at joints, dorsal surface of chela and all dactyls.

MEASUREMENTS (mm.): Shield, length 8.7, width 8.5; carapace 14.5; eyes 5.6; chela, length 11.6, width 6.0, dactyl 7.7; third right pereopod, basis-ischium 5.1, merus 8.0, carpus 6.7, propodus 7.8, dactyl 12.8.

Paguristes moorei Benedict

Paguristes moorei Benedict, 1901, p. 144, pl. 4, fig. 3.
--Gordan, 1956, p. 324.

Paguristes taeniatus Benedict, 1901, p. 143, key (nomen nudum).

MATERIAL EXAMINED: Twenty-three specimens from Cuba, Puerto Rico, and Saba Bank.

Holotype female, USNM 29207, "Puerto Rico, Fish Hawk."

Cuba ("Atlantis" Harvard-Havana Expedition): 22° 13' N., 81° 11' W.; 185-195 fms.; Apr. 6, 1939; sta. 3394; 1 female. 22° 34' N., 78° 16' W.; 180 fms.; Apr. 28, 1939; sta. 3397; 1 male. 22° 43' N., 78° 40' W.; 200 fms.; Apr. 29, 1939; sta. 3408; 1 female. 22° 50' N., 78° 52' W.; 230 fms.; Apr. 29, 1939; sta. 3414; 8 males, 2 females (one

ovig.). 22° 50' N., 78° 55' W.; 200 fms.; Apr. 30, 1939; sta. 3416; 1 male. 22° 49' N., 79° 00' W.; 195 fms.; Apr. 30, 1939; sta. 3418; 1 ovig. female. 22° 46' N., 79° 00' W.; 180 fms.; Apr. 30, 1939; sta. 3418; 1 male, 5 females (4 ovig., 1 juv.). 23° 09' N., 81° 27' W.; 175 fms.; May 9, 1939; sta. 3465; 1 female.

Lesser Antilles: 17° 33' N., 63° 35' W.; 125-132 fms.; Sept. 25, 1958; "Oregon" sta. 2356; 1 male in Murex shell.

RANGE: Cuba to Saba Bank; 132 to 230 fms.

DIAGNOSIS: Body compressed dorsoventrally, almost nude. Eyestalks at least equaling shield. Dorsal surface of chela covered with denticles.

DESCRIPTION: Shield slightly longer than wide. Frontal margin thickened, especially toward lateral teeth, with a short break here before margin continues posterolaterally to terminate at spinule beneath anterolateral angle. Rostrum and lateral teeth with a minute spinule at tip. Rostrum scarcely reaching ophthalmic ring. Posterolateral prominences with one spine, one or two spinules, and several denticles. Anterolateral areas spinulose laterally; separated from margin by narrow grooves. Cardiac plate and adjacent parts of carapace well calcified.

Eyes slightly longer than shield, more swollen distally than basally. Eye scales well separated, short, and tipped with a spinule. Extended antennular peduncle exceeds cornea by half of distal segment. Second segment of antennal pe.

duncle swollen medially; inner angle with a denticle, outer with a strong, bifid spine. Acicle long, four spines on proximal half of inner margin, none to two above this level on outer margin and two forming a bifurcate tip. Distal segment of peduncle not reaching cornea. Flagellum twice as long as carapace, with numerous but very short and fine setae.

Chelipeds strong, with five or six blunt spines on inner dorsal angle of carpus and propodus; denticles covering remainder of dorsal surface. Sparse, stiff setae rise from bases of denticles, chiefly on fingers. Chela narrow, twice as long as wide. Fingers meet along distal four-fifths of cutting edges. Worn, corneous edge covers over half of cutting edge of dactyl, with about five teeth on proximal part; opposite edge on pollex composed of about 12 low calcareous teeth.

Carpus of second pereopods with six spines on inner dorsal angle, propodus with eleven. Straw colored setae border rows of spines on dorsal surface. Dactyl long, with two dorsal rows of dense setae and one ventral. Ventral angle marked by row of fine, corneous spinules. Third pereopods lack spines except for one directed forward on anterodorsal margin of carpus. Corneous tips of all dactyls minute.

Fourth pereopods with narrow, triangular rasp on distal two-thirds of ventral angle of propodus. Dactyl

bears about nine small, corneous scales behind claw. Fifth pereopods with rasp covering distal half of chela.

Gonopods little separated basally. Second pair on male reaching well beyond first pair, densely setose at tips. Coxal openings on male covered by first pair of gonopods along inner edge. Unpaired pleopods on male feebly biramous. Marsupium of female well developed, translucent.

Basal segment of left uropod armed with numerous small spines, mainly in two irregular rows; largest spines marginal. Telson unusually asymmetrical, unarmed.

COLOR: Male in formalin four months. Eyestalks scarlet except for broad white stripe on inner dorsal surface. Antennal flagellum translucent proximally, carmine distally. Merus of chelipeds with a transverse crimson bar distally on sides. Band on merus of walking legs smaller and less distinct. Shield and dorsal surfaces of pereopods light salmon.

MEASUREMENTS (mm.): Male from "Atlantis" sta. 3414. Shield, length 8.8, width 9.5; carapace 15.3; eyes 8.5; chela, length 14.8, width 8.0, dactyl 9.6; third right pereopod, basis-ischium 7.3, merus 9.7, carpus 7.2, propodus 9.0, dactyl 16.5.

Paguristes planatus Milne Edwards and Bouvier

Paguristes planatus Milne Edwards and Bouvier, 1893, p.

43, pl. 4, figs. 1-5. --Gordan, 1956, p. 323.

RANGE: Barbados; 100 fms. Known only from holotype female at MCZ.

DIAGNOSIS: (after Milne Edwards and Bouvier, 1893)

Cephalothorax extremely flattened. Carapace wider than long. Shield with lateral borders armed with spinules. Rostrum obtuse, lateral teeth tipped with a spinule. Cardiac plate broad. Eyestalks shorter than front, equaling peduncles of antennules, exceeding those of antennae. Eye scales small, unequally bidentate at tips. Antennal acicle with three or four spines on outer edge, five or six on inner, tip bifurcate. Flagellum nude, short. External maxillipeds separated by a rather broad calcareous sternum.

Chelipeds short, surpassed by walking legs. Carpus with three strong spines on inner margin, four or five on outer and several spinules between margins. Two irregular rows of three spines on inner border of hand. Walking legs with two rows of spinules on carpus, four on propodus. Dactyl nearly as long as two preceding segments.

Paguristes puncticeps Benedict

Paguristes puncticeps Benedict, 1901, p. 144, pl. 4, fig. 4. --Gordan, 1956, p. 323.

MATERIAL EXAMINED: Fifteen specimens from three areas.

Types: Jamaica; Mar. 1-11, 1884; "Albatross"; 10 males, USNM 29203.

Florida: "Florida, coll. by sponge fishermen, don. by L. L. Hubbard, in rare encrusting bryozoan, Hippoporidra edax Busk"; 1 dry specimen, eyestalks with white spots bordered by red on pink background. Key West, shallow reef; Aug. 21, 1958; E. L. Pierce; 1 male, 2 females (1 ovig.).

Cuba: Varadero, Cardenas Bay, Hicocas Peninsula, off E. 1st. St., dredged along shore; Jan. 24, 1957; W. L. Schmitt; 1 ovig. female in shell of Strombus pugilis alatus Gmelin.

RANGE: Florida Keys to Jamaica; littoral.

DIAGNOSIS: Anterolateral angles of shield not reaching level of recesses in margin behind eyestalks. Eyestalks very little constricted, cornea not dilated. Stalks marked by a few white spots visible to the naked eye and abundant microscopic spots.

DESCRIPTION: This species is very closely related to P. sericeus, less closely to P. gravi. The diagnosis and following description are given to point out differences between this species and sericeus.

Shield considerably longer than broad. Cardiac plate narrow, much constricted about one-third of distance from anterior end. Eyes about three-fourths as long as shield. Cornea not as broad as basal and distal ends of stalk.

Chelipeds armed near margins with strong spines and denticles, all with dark corneous tips.

Male pleopods exhibit no apparent differences.

COLOR: Specimens from Key West after one month in alcohol. Carapace and pereopods mainly rose red shading to rose pink, sprinkled with white dots usually bordered by carmine. Distal parts of walking legs carmine to crimson. Chela red above with cream to buff tubercles. Eystalks carmine with about 20 white spots visible on each dorsal surface and a great many minute white spots, giving the background a reticulate appearance. Stalks salmon next to cornea.

MEASUREMENTS (mm.): Male from Key West. Shield, length 11.8, width 10.1; carapace 19; eyes 8.8. Other parts of body are similar in proportion to those of P. sericeus.

REMARKS: P. puncticeps is apparently a reef form whereas P. sericeus is found at generally greater depths and on shell bottoms. While fresh material of the two species is easily distinguished, bleached alcoholic specimens are rather difficult to identify.

Paguristes savi Milne Edwards and Bouvier

Paguristes savi Milne Edwards and Bouvier, 1893, p. 55. pl. 5, fig. 1-7. --Benedict, 1901, p. 143 (key), p. 144, pl. 4, fig. 2.

MATERIAL EXAMINED: Nine specimens from eight localities.

Holotype male, Barbados, 288 fms., "Blake".

Florida: Off St. Augustine, 263 fms., "Albatross" sta. 2655, 1 male.

Cuba: South of Cuba, 400 fms., "Albatross" sta. 2128, 1 juv. female. 20° 45' N., 75° 20' W.; 230 fms., Apr. 20, 1939; "Atlantis" sta. 3375; 2 males. 22° 33' N., 78° 10' W.; 245 fms.; Apr. 26, 1939; "Atlantis" sta. 3387; 1 male. 22° 50' N., 79° 08' W.; 245 fms.; Apr. 30, 1939; "Atlantis" sta. 3423; 1 female. 23° 21' N., 79° 55' W.; 375 fms.; May 3, 1939; "Atlantis" sta. 3447; 1 female.

Puerto Rico: Mayaguez, 1 female, probably collected by "Fish Hawk".

RANGE: Florida to Puerto Rico, 230 to 400 fms.

DIAGNOSIS: Shield broader than long, eyes short, eye scales with four terminal spinules.

DESCRIPTION: Shield somewhat heart-shaped, slightly broader than long, margin thickened across entire front. Rostrum rounded, shorter than lateral teeth. Cardiac plate long, triangular, widest at cervical groove. Shield with a triangular calcified plate on either side posterolaterally.

Eyes less than three-fourths as long as shield, somewhat swollen at both ends. Eye scales with four terminal spinules, second spinule from inside longest. Spinules hidden by setae arising more posteriorly on scales. Antennular peduncle exceeds eyes by length of terminal segment. Second segment of antennal peduncle lacks spine on inner

angle; two appear on short, outer projection; base with a conspicuous depression. Third segment of peduncle slightly exceeds cornea. Acicle long, exceeding cornea, with five or six spinules on inner margin, three or four on outer; long, fine setae rise from numerous punctae on inner dorsal surface.

Chelipeds spined on inner margin of carpus; hand quite smooth dorsally. Ischium with a row of six small tubercles on inner ventral margin; merus with eight spines in same position. Inner dorsal surfaces of carpus and propodus each armed with four strong spines. A small terminal spine on carpus behind articulating socket, a second at dorsolateral angle. Two rows of low tubercles appear behind gape on hand. Sparse setae stem from these and other tubercles on hand and, more thickly on fingers. Usual corneous cutting edges composed of many, minute plates on distal part of dactyl meeting broad, corneous tip of pollex. Fingers gaping except at corneous tips.

Merus of second pereopod with an even row of 12 sharp denticles on ventral angle. Carpus armed with five or six spines on dorsal surface, three spinules on inner distal margin below anterodorsal spine. Nine evenly spaced spines on dorsal angle of propodus. Seven or more minute tubercles form a short row on proximal dorsal angle of dactyl of second pereopods. Dactyl of walking legs with a row of scale-like, flexible setae on ventral margin. Third pereopods

unarmed except for single distodorsal spinule on carpus.

Fourth pereopods with narrow rasp about three scales wide covering almost three-fourths of propodus. Coxa with crest of four small denticles on proximal anterior angle.

Male gonopods separated by a moderate distance basally. Unpaired pleopods with a feeble external ramus. Uropods extremely unequal, those on left about four times as large as on right. Telson also asymmetrical, terminal lobes evenly armed.

MEASUREMENTS (mm.): Shield, length 9.3; width 10.0; carapace 15.0; eyes 5.6; chela, length 10.6, width 5.8, finger 6.6; third leg, basis-ischium 6.3, merus 8.1, carpus 6.4, propodus 7.6, dactyl 14.0.

Paguristes sericeus A. Milne Edwards

Paguristes sericeus A. Milne Edwards, 1880, p. 44.

--Balss, 1924, p. 178. --Gordan, 1956, p. 324.

Paguristes rectifrons Benedict, 1901, p. 145, pl. 4, fig. 7. --Gordan, 1956, p. 324.

Paguristes tenuirostris Benedict, 1901, p. 143, pl. 4, fig. 1. --Gordan, 1956, p. 324.

MATERIAL EXAMINED: Seventeen specimens from the coasts of two states and two islands.

Texas: Heald Bank, off Sabine; W. F. Hewatt; 1 male (Iden. by F. A. Chace, Jr., with remarks, "Eyestalks uniform

red-orange, not spotted").

Florida: Off Fort Walton; 14-15 fms.; June 3-4, 1947; Frank Lyman; 1 ovig. female. Off Cape San Blas, 29° 28' N., 85° 31' W.; 12 fms.; Feb. 1, 1956; "A. A. Jakkula"; 3 males, 3 females. 2 mi. south of Alligator Point, Franklin Co.; July 10, 1957; 3 fms.; H. J. Humm; 1 female in shell of Strombus pugilis alatus Gmelin. Deadman Bay, 29° 35' N., 83° 56' W.; 9½ fms.; Nov. 7, 1901; "Fish Hawk" sta. 7153; 1 female. 21 3/4 mi. N.E. Cedar Key Light; 5½ fms., Jan. 11, 1913; 1 juv. female in shell of Junonia. Off Anclote Keys; 28° 58' N., 83° 54' W.; 10 fms., Nov. 7, 1901; "Fish Hawk"; 1 male. North of Tortugas; 25° 38' N., 83° 18' W.; 33 fms., Mar. 1, 1889, "Grampus" sta. 5077; 1 juv. female (type of P. tenuirostris, USNM 20224). Off Miami; 30 fms.; J. B. Henderson; 1 female.

Jamaica: 17° 36' N., 76° 46' W.; 966 fms.; Mar. 11, 1884; "Albatross" sta. 2140; 1 male, right chela much smaller.

Puerto Rico: Mayaguez Harbor; 80 fms.; Jan. 20, 1899; "Fish Hawk" sta. 6065; 1 juv. male in shell of Conus. Off Vieques Id., Puerto Rico, 14 fms., Feb. 8, 1899, "Fish Hawk" sta. 6085, 1 male from shell of Strombus pugillis alatus Gmelin (type of P. rectifrons, USNM 29204).

RANGE: Texas and Florida to Guadeloupe; 3 to 36 fms.; records at 80 and 966 fms. are doubtful.

DIAGNOSIS: Eyes long, stalks somewhat narrowed between base and cornea. Anterolateral angles of shield even with

marginal depressions on either side of rostrum. Carapace flattened, broad; walking legs widely separated by sternal plates. Chela flattened, covered with fine hair; corneous tips of spinules light yellow. Color of eyestalks solid.

DESCRIPTION: Shield longer than broad; frontal margin raised between lateral teeth. Rostrum long, triangular, variable in length, usually exceeding ophthalmic ring. Gastric region bordered laterally and anteriorly by a groove which mirrors frontal margin. Shield swollen at the lateral angles, with several spinules appearing on posterior part of raised area. A broad depression separates each antero-lateral area from a small area behind it; latter has a few anteriorly directed, short spines. Posterior part of carapace with calcified mid-region cut by many longitudinal furrows.

Eyestalks long and somewhat swollen at both ends. Each stalk with a row of 7 or 8 punctae, from which fine setae arise, mediad of dorsal midline. Eye scales narrow, triangular, with a spinous tip.

Antennular peduncle not reaching cornea. Second segment of antennal peduncle with three spines, a minute one arising from an elongate protuberance below acicle and two at lateral apex. Terminal segment bears two or three sharp spinules on proximal half of dorsal angle. Acicle with two strong spines on inner margin and two on outer, plus a terminal spine. Flagellum thin, short, barely surpassing

carpus of cheliped; a fringe of minute setae at each articulation.

Dorsal surfaces of carpus and chela denticulate, denticles larger and tipped with corneous spines toward margins. Merus with a few small spines on ventrolateral margin. Dorsal surface of carpus with numerous spinules, largest near inner edge. Surface of chela similar to that of carpus, much more setose. Tips of fingers spooned.

Walking legs with spines on dorsal surfaces of carpus and propodus. Carpus of second pair with two or more anterodorsal spines separated by a deep groove from a similar group of anterolateral spines. Fourth pereopods with narrow rasp covering two-thirds of distoventral angle. Large rasp of fifth pereopods covering distal two-thirds of chela.

First pair of male pleopods separated at bases by length of one pleopod. Outer ramus of unpaired pleopods in males rudimentary. Base of left uropod armed with a few spinules. Telson asymmetric; borders of lobes spinulose.

COLOR: Similar to that of P. puncticeps except that eyestalks are solid red.

MEASUREMENTS (mm.): Female from Alligator Harbor area. Shield, length 9.2, width 9.2; carapace 15.5; eyes 8.1; chela, length 9.2, width 6.7; dactyl 6.1; third right pereopod, basis-ischium, 4.0, merus 7.0, carpus 6.4, propodus 6.2, dactyl 13.5.

REMARKS: The similarities between this species and its close relatives, P. puncticeps and P. gravi are discussed under the latter species.

Paguristes spinipes A. Milne Edwards

Paguristes spinipes A. Milne Edwards, 1880, p. 44.

--Gordan, 1956, p. 324.

Paguristes visor Henderson, 1888, p. 78, pl. 8, fig. 3.

Paguristes armatus Hay, 1917, p. 73. --Gordan, 1956, p. 321.

MATERIAL EXAMINED: Ten specimens from seven localities.

Off North Carolina: 30 mi. south of Cape Lookout light-ship, "Fish Hawk," 1 juv. male (type of P. armatus).

Off Florida: 27° 28' N., 78° 44' W.; 215 fms.; Feb. 3, 1957; "Combat" sta. 237; 1 male. 27° 27' N., 78° 58' W.; 180 fms.; Feb. 2, 1957; "Combat" sta. 235; 1 female.

Gulf of Mexico: Off Florida, 26° 04' N., 84° 18' W.; 98 fms.; May 8, 1952; Robert H. Stewart; 1 male, 1 female.

Cuba: 23° 05' N., 82° 33' W.; 260 fms.; Mar. 23, 1939; "Atlantis" sta. 3303; 1 female. 22° 50' N., 78° 52' W.; 230 fms.; Apr. 29, 1939; "Atlantis" sta. 3414; 1 male.

Yucatan: Off Arrowsmith Bank; 20° 59' N., 86° 23' W.; 130 fms.; Jan. 22, 1885; "Albatross" sta. 2354; 1 female.

Martinique: 191 fms.; "Blake" sta. 210; 1 male.

St. Vincent: 95 fms.; "Blake" sta. 95; 1 juv. male.

RANGE: North Carolina and northeastern Gulf of Mexico to Pernambuco, Brazil (Henderson , 1888); 103 to 350 fms.

DIAGNOSIS: Body somewhat compressed laterally; first pair of walking legs armed with strong spines. Telson symmetrical, unarmed.

DESCRIPTION: Carapace with entire frontal margin thickened; margin curving beneath anterolateral angles, submarginal spinule at lateral terminus. Rostrum triangular, exceeding lateral teeth, barely covering ophthalmic ring. Shallow, transverse groove immediately behind front joined by three longitudinal grooves; median groove short, laterals extending posterolaterally to border of shield. Posterior parts of lateral grooves with setose tubercles on either side. Cardiac plate short, calcified.

Eyes long, equaling shield, curved outwardly and swollen at each end. Stalks with a punctate line of setae dorsally. Eye scales simple, terminating in a single spine. Antennular peduncle reaching base of cornea. Antennal peduncle reaching two-thirds length of eye; second segment with a small spine on inner angle, two on outer. Acicle with two sharp, inner spines near base, another past midpoint, and one at terminus. One or two spines occur opposite third inner spine. Flagellum equaling pereopods, nearly nude. Merus of third maxillipeds with four spinules on lower margin.

Chelipeds exceeding by half length of dactyl of walk.

ing legs. Ischium denticulate on inner ventral margin. Merus with an oblong, rounded boss over one mm. in length on proximal inner ventral border; ventral margins denticulate beyond boss. Dorsal angle of merus with three distal spinules. Carpus and propodus with corneous-tipped, stout denticles dorsally. Fingers close without a gape; corneous cutting edge on distal half of dactyl opposes welded row of calcareous teeth on pollex. Outer surface and lower border of hand with spinous denticles, inner border with large tubercles.

Walking legs sparsely setose on dorsal and ventral angles, laterally on merus of first pair and in numerous punctae on sides of dactyl; row of punctae on inner surface of dactyl presents longest and densest setae near tip. Carpus of first walking leg with a small, upturned groove on outer dorsal surface; dorsal spines of carpus number three to six; latter number appearing normal. Dorsal spines on propodus of same leg number seven to ten, with ten, or more, spinules on proximal dorsal surface of dactyl. Second walking leg unarmed; ischium much longer than in preceding leg, merus shorter, other segments similar.

Fourth pereopods reaching second segment of antennal peduncle in male, base of first segment in female. Propodus with long triangular rasp on ventral surface; dactyl with eight or nine corneous scales in male, five in female. Fifth pereopods with rasp on distal half of outer surface.

Gonopods strong in male, first pair approximated at bases; female with terminal segment narrow and bases more separated. Unpaired pleopods of male with external ramus a minute tubercle. Base of left uropod with ten or more corneous spinules; base of right with these plus a few calcareous spinules. Telson symmetrical, unarmed.

COLOR: Specimens from Saba Bank after 4 months in formalin. Shield with rostrum and anterior margin white, followed by peach red, shading quickly to salmon with a few white spots on rest of shield. Eyestalks faintly grey, cornea black. Antennae buff above proximally, scarlet ventrally to carmine distally. Merus of chelipeds white, with a prominent, transverse band of red just behind distal margin on each side. Short spinules on dorsal surfaces of carpus and chela scarlet at tips; denticles and background pale buff. Walking legs with similar markings on merus; more distinct on outside. Propodus and dactyl orange buff.

MEASUREMENTS (mm.): Male from Saba Bank. Shield, length 11.7, width 7.8, carapace 18.5; eyes 12.0; right chela, length 16.0, width 6.2, dactyl 9.1; third right pereopod, basis-ischium 7.4, merus 11.5, carpus 8.5, propodus 10.8, dactyl 19.0.

Paguristes tortugae Schmitt

Paguristes tortugae Schmitt, 1933, p. 7. --Wass, 1955, p. 134. --Gordan, 1956, p. 324.

MATERIAL EXAMINED: 12 specimens from North Carolina, Florida, and French Guiana.

North Carolina: Southwest of Cape Lookout, $34^{\circ} 33'$ N., $76^{\circ} 41'$ W.; 9 fms.; Feb. 16, 1940; "Pelican" sta. 185-5; 1 male.

Florida (West Coast): St. Teresa, Franklin Co.; Sept. 27, 1952; H. J. Humm, 1 male, USNM 94047. Ten mi. southwest of Cedar Key; May 20, 1956; E. L. Pierce; 1 ovig. female. Mullet Key, Oct. 16, 1954; 2 specimens (sent to Paris Museum). Tortugas (coll. by W. L. Schmitt): North of Loggerhead lighthouse; 20-30 ft.; Aug. 6, 1924; 1 male; off Bush Key Reef; June 19, 1925; 1 ovig. female; Aug. 14, 1930; 2 males, 1 ovig. female; Fort Jefferson moat; Aug. 11, 1924; 1 male.

French Guiana: Labeled "Oregon" 2320, (see notation under P. depressus); 1 ovig. female.

RANGE: Beaufort, N.C., to French Guiana; to 9 fms. at Beaufort, 34? fms. off French Guiana.

DIAGNOSIS: Anterior part of body and appendages clothed with fine, plumose hair. Eyestalks and mouth appendages with ringed pattern of color markings. Rasp of fourth pereopod five to seven scales wide.

DESCRIPTION: (Male from St. Teresa, Fla.) Shield convex, smooth medially, $1 \frac{1}{3}$ times as long as wide; anterior margin thickened, particularly behind eyes. Rostrum covers ophthalmic ring; a minute spinule on each lateral tooth. Two

deep slits or grooves just posterior to frontal margin are separated by a median bridge. Raised lateral areas spinulose. Cardiac plate calcified anteriorly.

Eyes shorter than width of carapace, swollen at base, minutely so at cornea. Eye scales rounded; three spines distally, the outer minute. Antennular peduncle equals eyes. Second segment of antennal peduncle with three strong spines on outer projection of small denticle on inner angle. Ventral spine on third segment broad, sharp-tipped. Acicle with three spines on outer border, one to three on inner border; tip spinous. Flagellum short, barely reaching chela; with short, fine setae.

Chelipeds short, moderately stout; dorsal surface of carpus and propodus and dorsal angle of merus covered with low, scale-like tubercles and ridges from which anteriorly directed setae arise. Strong, corneous-tipped spines on inner dorsal margin of carpus and manus; four on former and three on latter behind dactyl. Fingers gape proximally; tips hoof-shaped, corneous cutting edges extending nearer gape on dactyl than on pollex; low, calcareous teeth on remainder of cutting edges.

Second pereopods with several spinules on dorsal angles of carpus and propodus. Both walking legs with transverse scale-like ridges on ventral surfaces of carpus and propodus; pilose setae obscuring both ventral and dorsal angles. Fourth pereopods with rasp on distal three.

fifths of propodus five to seven scales wide; dactyl lacking a rasp; chela of fifth pair with a rasp on distal half.

Gonopods complex; first pair forming a deep, open gutter. Second pair with terminal segment spatulate, distal part fringed with stiff setae. Inner ramus of first unpaired pleopod one-fourth length of outer, rudimentary on last two pleopods. Brood pouch of female only a narrow flap. Telson with several strong spines on distal margin. Posterior edge of basal segment of left uropod presents a few spinules.

COLOR: After W. L. Schmitt, (personal notes from Tortugas): Eyestalks with a white band behind black corneas, followed by a band of wine purple, another of white, and a band of diffuse purple ahead of buff color on proximal half of stalks. Peduncles of antennules and antennae banded with purple. Short antennal flagellum with a purple band on each segment.

REMARKS: Comparison of this species with Pacific coast forms reveals a close similarity with Paguristes tomentosus (H. Milne Edwards, 1848), of which P. anahuacus Glassell, 1938, is probably a synonym. P. tomentosus is a slightly larger species with fewer corneous spinules on the first three pereopods and significant differences in the male gonopods.

MEASUREMENTS (mm.): Male from St. Teresa. Shield, length 5.3, width 4.0; carapace 8.5; eyes 3.5; chela, length

5.0, width 2.3, dactyl 2.8; third right pereopod, basis-
ischium 2.2, merus 3.5, carpus 3.2, propodus 3.5, dactyl 5.0.

Paguristes triangulatus Milne Edwards and Bouvier

Paguristes triangulatus A. Milne Edwards and Bouvier,
1893, p. 40, pl. 4, figs. 6-12. --Gordan, 1956, p. 324;
Springer and Bullis, 1956, p. 16.

MATERIAL EXAMINED: Forty-four specimens from five
localities.

Type female, Barbados, 73 fms., "Blake" sta. 290.

Off Cape Hatteras: 35° 54' N., 74° 25' W.; 75 fms.;
June 17, 1957; "Combat" sta. 384; 4 males, 2 females from
Phalium and Conus shells.

Northeast of Mississippi Delta: 29° 20' N., 88° 17' W.;
33 fms.; "Pelican" sta. 13; 1 male.

Tortugas and Florida Keys: (Specimens collected by
W. L. Schmitt unless otherwise stated). South of Loggerhead
Key; 40 fms.; 4 males, 2 ovig. females, 1 each in shells of
Conus, Murex, Distorsio and Phalium. Aug. 20, 1931; Paul
Bartsch, 7 males, 8 females (5 ovig., 1 parasitized), 2
juveniles, mainly in shells of Phalium, Distorsio, and
Polystira. South of Tortugas; 39 fms.; June 26, 1932; 2
males, 5 females (3 ovig.); 1 in Oliva shell, others in
Distorsio shells. South of Tortugas; 40 fms.; Aug. 14, 1933;
H. H. Darby; 1 ovig. female. 36-40 fms.; Paul Bartsch; 1
male, 1 female with rhizocephalan parasites; 30 fms., June 11,

1925, 1 male in Polystira shell. 40-45 fms.; June 17, 1932; 1 male in Polystira shell. 24° 26' N., 81° 46' W.; 45 fms.; Jan. 15, 1885; "Albatross" sta. 2318; 1 male in Murex shell. Off Key West; U. of Iowa sta. 24-60 fms.; June 19, 1893; 1 in Murex cabriti shell.

Cuba: 22° 36' N., 78° 22' W.; 210 fms.; Apr. 28, 1939; "Atlantis" sta. 3403; 1 male in Polystira shell.

RANGE: Cape Hatteras, N.C., to Barbados; 30 to 210 fms. (taken only once below 84 fms.).

DIAGNOSIS: Eyes equaling shield, stalks red. Rostrum triangular. Chelipeds sparsely setose, with spines on inner margins, fine denticles on dorsal surfaces of carpus and chela. First pair of male pleopods approximated.

DESCRIPTION: Shield as broad as long. Triangular rostrum slightly exceeding lateral teeth. Margin of entire front more or less thickened. Shield somewhat rugose and sparsely setose anteriorly and laterally. Cardiac plate broadest at ends, narrowest at three-fourths of distance to posterior margin. Gill cover calcified anteriorly and, lightly so, posteriorly.

Eyes as long as shield, widest at cornea; each stalk with dorsal line of fine setae. Eye scales well separated, short and with conical tips. Ophthalmic somite exposed. Peduncle of antennule exceeding eyes, that of antenna not exceeding. Second segment of antennal peduncle with a minute denticle at inner angle, bifid spine on outer pro-

jection. Acicle well armed with four spines on lower inner margin, one above these on outer margin and two at tip. Flagellum flattened, sparsely setose, equaling pereiopods.

Chelipeds armed with short spines and strong denticles on inner dorsal angles. Dorsal surfaces of merus, carpus and palm with spinous denticles; fingers with rounded granules dorsally and laterally. Cutting edges meeting throughout; teeth of pollex calcareous, united, of dactyl corneous on distal half. Tips corneous, minute. Setae fine, evenly dispersed dorsally, plentiful but not obscuring surface.

Dorsal spines on first walking leg include five or six on carpus, nine on propodus and a few proximal spinules on dactyl. Dorsal angles of both walking legs appear scalloped because of even punctae supporting tufts of setae; ventral angles serrate, each serration with a fine, stiff seta. Claws short, thin.

Fourth pereiopods with small, triangular rasp on distal third of ventral angle; single row of fine scales on dactyl. Fifth pereiopods with a rasp on distal half of chela. First pair of male gonopods short, nearly contiguous basally. Outer ramus of unpaired pleopods scarcely evident. Telson unarmed, slightly asymmetrical.

COLOR: Specimens from "Combat" sta. 384 after one year in alcohol. Eyestalks orange vermillion. Lateral stripes of antennal flagellum scarlet vermillion. Shield and pereiopods cream.

MEASUREMENTS (mm.): Male from "Combat" sta. 384. Shield, length 7.0, width 6.9; carapace 13.5; eyes 7.0; chela, length 11.8, width 6.5, dactyl 8.0; third pereopod, basis-ischium 6.2, merus 7.2, carpus 5.8, propodus 6.1, dactyl 11.9.

Paguristopsis n. gen.

Type species: Paguristes hummi Wass, 1955, p. 148.

Differs from Paguristes in absence in females of an anterior pair of pleopods and a complete lack of a brood pouch. Differs from Isocheles in presence of two anterior pairs of pleopods in males. First pair of male pleopods with numerous recurved hooks on outer distal margin.

This genus is erected to include the type species and Paguristes weddelli (H. Milne Edwards), a species found on the coasts of Chile and Peru; a specimen in the USNM from the Gulf of California may also belong to the latter species.

Paguristopsis hummi (Wass)

Paguristes hummi Wass, 1955, p. 148, figs. 1-4.

MATERIAL EXAMINED: Eighty specimens from Georgia and the northern and eastern coasts of the Gulf of Mexico.

Holotype male, USNM 95596; Alligator Harbor, Franklin Co., Fla.; June 1, 1952; A. S. Pearse. Paratypes: 1 male in a sponge; Apr. 17, 1952; and 2 males in a single cavity of a

sponge; May 10, 1952; Alligator Harbor; H. J. Humm. 1 male from a Murex shell; Alligator Harbor; Apr. 4, 1953. 4 males, 1 female; Oct. 10, 1953; 25 males, 20 females (10 ovig.); Oct. 16, 1954; tidepools at Mullet Key, Tampa Bay, Fla.; M. L. Wass.

Georgia: 31° 58' N., 80° 44' W.; 6½ fms.; Feb. 3, 1940, "Pelican" sta. 181-1; 1 female.

Texas: M_Cr 75, M_Cr 78, W. G. Hewatt; 2 males.

Louisiana: 28° 36' N., 90° 55' W.; 10 fms.; Mar. 18, 1938; Peterson grab; "Pelican" sta. 33; 1 male. Breton Is. Gosier Is.; July 18, 1935; "Pelican"; 1 male.

West coast of Florida: 29° 28' N., 85° 31' W.; 12 fms.; Feb. 1, 1956; "A. A. Jakkula"; 1 female in large bryozoan, Hipporidra edax Busk. Alligator Harbor: Oct. 29, 1955, M. L. Wass, 1 male in a sponge; July 7, 1957; H. J. Humm; 1 male in a shell nearly covered by a sponge. Sea Horse Key; Nov. 2, 1957; M. L. Wass; 1 male. Opposite Anclote River; Nov.-Dec., 1900; J. E. Benedict; 1 female in a shell which also contained an annelid. Egmont Key, Fla.; W. L. Coons; 3 males, 3 females (1 female regenerating both chelipeds), USNM 996 (date unknown). Mullet Key; Oct. 16, 1954; M. L. Wass; 7 males, 1 ovig. female (sent to Paris Museum). Lemon Bay, trawled in pass; Jan. 25, 1938; Olga Hartman; 1 male, 1 female. Charlotte Harbor; 2 fms.; Feb., 1884; Henry Hemphill; 2 males, USNM 6664.

RANGE: Georgia and northern coast of Gulf of Mexico

from Galveston, Texas to Charlotte Harbor, Fla.; probably not found on east coast of Florida or in the Keys.

DIAGNOSIS: Other than generic characters, antennal flagellum short, with two rows of long, ventrolaterally directed setae, as in Isocheles. Eyes narrow, cornea not dilated; eye scales approximated.

DESCRIPTION: Shield longer than wide; rostrum obsolescent, exceeded by pointed lateral teeth. Eyes shorter than shield; scales long, approximated, lightly armed laterally. Antennular peduncle exceeding eyes by half of terminal segment; antennal peduncle exceeding slightly. Antennal flagellum subequal to chelipeds, setae in two ventral rows, each seta about half as long as flagellum.

Chelipeds equal, weak, articulating horizontally with carpus. Several strong spines on inner dorsal margin of carpus, propodus, and dactyl. Spines on outer margin smaller. Fingers meet only at tips. Fine pilose hairs appear on all pereiopods, particularly on dorsal surfaces. Second pereiopods feebly armed on dorsal angles of carpus and propodus. Walking legs easily exceed chelipeds.

First pair of gonopods strong, well separated basally; second pair weak, not extending beyond first pair. Unpaired pleopods of male uniramous. Terminal lobes of telson asymmetric, each armed with two corneous spinules.

COLOR: Only outstanding color mark a bright blue area bordered anteriorly by a black and a yellow band on inner

surface of merus of chelipeds. Antennal flagellum pale blue. Dactyl of walking legs marked by two reddish bands.

MEASUREMENTS (mm.): Shield, length 3.2, width 2.7; carapace 6.5; eyes 2.9; chela, length 4.6, width 2.5, dactyl 2.7; third right pereopod, basis-ischium 1.8, merus 2.9, carpus 2.5, propodus 3.5, dactyl 5.0.

REMARKS: This species is strikingly similar to P. weddelli. The latter is several times larger in the adult. A male from San Juan Bay, Peru, Allan Hancock Foundation sta. 828_38, has a carapace length of 20 mm. The most striking difference is in the telson; that of weddelli has the small terminal lobes separated by the broad median plate, the margin of which is armed with 13 short, corneous spinules.

Other differences in weddelli are the narrower cornea, the strongly angled claw on the dactyl of the walking legs, the more numerous callosities and setae under the thorax, and in the first pair of male pleopods. In weddelli the latter have only 13 recurved spines on the distal margin and the arrangement of setae is quite different.

Petrochirus bahamensis (Herbst)

Cancer maximus bahamensis Catesby, 1743, p. 34, pl. 34.

Cancer bahamensis Herbst, 1791, p. 30.

Pagurus granulatus Olivier, 1811, p. 640.

Petrochirus granulatus Stimpson, 1858, p. 233. --
Rankin, 1910, p. 82. --Gordan, 1956, p. 339.

Petrochirus bahamensis Rathbun, 1897, p. 42. --
Boone, 1925, p. 76; 1930, p. 21, pl. 1; ?1938, p. 261.
--Hildebrande, 1954, p. 271, 326; 1958, p. 259.

MATERIAL EXAMINED: Thirty-six specimens from the
coasts of eight states and countries.

Texas: Off Port Aransas; April 28, 1948; J. W. Hedg-
peth; 2 males. Thirty mi. north of Port Isabel; 17-20 fms.;
Nov. 16-18, 1950; H. H. Hildebrand; 1 female. Off Port
Isabel; Mar. 30, 1947; 9-10 fms.; J. W. Hedgpeth; 1 male,
5 females. 28° 48' N., 94° 39' W.; 11 fms.; May 5, 1938;
"Pelican" sta. 60-3, 1 male. 29° 00' N., 94° 38' W.; 8 fms.;
Jan. 21, 1939; "Pelican" sta. 104-5; 1 juv. female.

Louisiana: 29° 20' N., 88° 17' W.; 33 fms.; Feb. 5,
1938, "Pelican" sta. 13; 1 male. 29° 06' N., 92° 16' W.;
8.5 fms.; May 10, 1938; "Pelican" sta. 65-10; 1 juv. female.
29° 10' N., 93° 23' W.; 9 fms.; May 10, 1938; "Pelican" sta.
64-4; 1 juv. male.

Mississippi: Ship Is.; June, 1941; R. J. Miller; 1
male, MCZ 11941, carapace length 52 mm.

Florida (west coast): Panama City; 12 fms.; Oct. 13, 1956;
G. D. Grice; 1 male, carapace length 54 mm. 29° 07' N., 85° 40'
W.; 50 fms.; Mar. 10, 1939; "Pelican" sta. 154-3; 1 male,
carapace length 70 mm. 29° 25' N., 84° 56' W., 13 fms.; Feb.
10, 1957; "Oregon" sta. 1674; 1 juv. male. Hog Is. Key;

Sept. 7, 1938; "Pelican" launch, 1 male. Sarasota, Lido Beach; Feb. 15, 1957; J. Vaughn, 1 male. Sanibel Is.; March, 1938; 1 male, 2 females, MCZ 10156.

Tortugas: 40 fms.; Aug. 4, 1931; Murex shell; W. L. Schmitt; 1 female. Bird Key Reef; July, 1931; W. L. Schmitt; 1 male, carapace length 55 mm. Fort Jefferson; July, 1930; W. L. Schmitt; 1 male, carapace length 65 mm.

Off Jacksonville: 30° 28' N., 80° 48' W.; 15 fms.; Jan. 26, 1940; "Pelican" sta. 176-7; 1 female.

Jupiter Inlet: $\frac{1}{4}$ mi. north in Indian River, June 22, 1957; J. Yount and J. Flora, 2 males, carapace lengths 57 and 63 mm.

Yucatan: 20 mi. northwest of Campeche; Feb. 7, 1951; H. H. Hildebrand; 3 males. Golfo de Campeche; Pedro Fuentes, 2 males, MCZ 12332.

Cuba: Havana; Jan. 8, 1937; L. Howell Rivero; 1 male, MCZ 9743, carapace length 53 mm. 20° 03' N., 77° 55' W.; 13 fms.; Apr. 9, 1939; "Atlantis" sta. 3347; 1 male.

Surinam: 06° 30' N., 55° 52' W.; 17 fms.; Sept. 3, 1958; "Oregon" sta. 2272, 1 female.

Off mouth of Amazon: 02° 31' N., 48° 48' W., 55-60 fms.; Nov. 15, 1957; "Oregon" sta. 2061; 1 female.

RANGE: Beaufort, N.C., to Rio de Janeiro; intertidal to at least 55 fms.

DIAGNOSIS: Largest hermit crab in western Atlantic. Adults usually in shells of Strombus and Buyscon. Right

chela noticeably larger than left. Chelipeds nude except for minute fringe of pubescence on scalloped tubercles of chelae.

DESCRIPTION: Shield relatively small, flattened. Rostrum supporting several stiff setae, equaling lateral teeth. Remainder of carapace large, membranous. Eyes slightly exceeding shield in young, subequal in large specimens. Eye scales small, terminating in a small spine. Antennular peduncle equaling eyes; that of antenna shorter. Acicle small, with two minute spinules on inner edge. Flagellum equaling pereopods.

Chelipeds moderately armed, similar. Chela covered with scale-like tubercles; each tubercle fringed with minute, pubescent setae as in Dardanus venosus. Cutting edges similar in both chelae, tips calcareous on major member, corneous on minor. Walking legs unarmed, densely setose in rows along dorsal, ventral, and inner surfaces; claw short, stout.

Fourth pereopod imperfectly chelate; pollex portion of propodus covered ventrolaterally with rasp of minute scales. Propodus of fifth pair chelate, rasp on distal half. Male pleopods uniramous. Telson short, asymmetric; fine setae and spinules on margin.

COLOR: Reddish color of chelipeds and walking legs becomes darker distally. Pubescent fringes of tubercles uniformly dark red. In life, bright purple colors are on

sides of antennular and antennal peduncles.

MEASUREMENTS (mm.): Male from Sarasota, Fla.: Shield, length 34, width 32; carapace 68; eyes 29; major chela, length 73, width 38, dactyl 45; minor chela, length 66; third right pereopod, basis-ischium 21, merus 31, carpus 30, propodus 30, dactyl 55.

REMARKS: The male from Sarasota weighed 400 gms. and was taken from a Busycon shell weighing 595 gms., while the juvenile male from "Oregon" sta. 1674 weighed 0.36 gms. and was found in a bryozoan, Hippoporidra edax Busk, which weighed 18.5 gms., about 50 times as much.

The relative sizes of the chelae are usually not greatly different but in four chelae measured, the length of the left member ranged from 66 to 90% of that of the right.

Family Paguridae Latreille

Shield of carapace usually longer than broad; rostrum obsolescent, rarely covering ophthalmic somite. Gill covers usually membranous, if calcified anteriorly surface is broken into numerous plates.

Eyes usually shorter than shield and more or less dilated at cornea. Eye scales usually simple at tips. Antennular peduncles usually exceeding eyes; those of antennae less often doing so. Latter rarely well armed; flagellum usually longer than carapace and nude or nearly so.

External maxillipeds widely separated by a sternum; latter often with a median suture flanked by a denticle on each side.

Gill pairs 11 or 13 except in Octopagurus, which has eight; lamellae usually biseriate, quadriseriate in three genera.

Right cheliped more or less enlarged, never smaller than left. Chela articulating vertically with carpus. Cutting edges of major chela present calcareous teeth of varying sizes; those of minor chela composed of fine corneous teeth supported by minute calcareous ones. Walking legs usually slender, elongated; those on right a little longer. Dactyls often twisted in deep-water forms.

Vas deferens protruding in seven genera. Gonopods never

present in both genera; two pairs found in males of four genera, one pair in males of three genera and females of five genera. A single genus (Pagurodes) has the vas deferens protruding in the male and the female with a pair of gonopods. No genera have the male with gonopods and a protruding vas deferens.

Abdomen usually twisted and presenting three or four unpaired pleopods in males. Parapagurus and Munidopagurus have the abdomen much reduced and folded beneath the thorax. Four genera have males lacking unpaired pleopods. Telson and uropods asymmetric in most genera. Telson generally deeply cleft distally.

This family contains very few reef-dwelling forms but the genus Pagurus contains most cold-water pagurids. It also has a large number of genera and species found on the lower part of the shelf or at greater depths.

Key to Genera

1. Male with vas deferens protruding on one or both sides.....2.
 Vas deferens never protruding.....8.
2. Vas deferens protruding on only one side.....3.
 Vas deferens protruding on both sides, the right ending in a long filament.....Nematonagurus.
3. Only right vas deferens normally protruding.....4.
 Only left vas deferens normally protruding.....6.

4. Female with a pair of anterior abdominal appendages.....Pagurodes.
 Female lacking paired anterior abdominal appendages...5.
5. Right vas deferens recurves over right flank of abdomen; four unpaired pleopods in both sexes.Catapagurus.
 Right vas deferens crossing beneath abdomen or extending straight back.....6.
6. Right vas deferens sabre-shaped.....Catapaguroides.
 Right vas deferens extending straight back or crossing under abdomen and up left side.....Cestopagurus.
7. Left vas deferens coiled in a spiral, right cheliped not much larger than left.....Spiropagurus.
 Left vas deferens only curved, right cheliped much larger than left.....Anapagurus.
8. Paired anterior pleopods present in either male or female but not in both.....9.
 Paired anterior pleopods absent in both sexes.....19.
9. Paired anterior pleopods present in male only.....10.
 Paired anterior pleopods present in female only.....16.
10. Two pairs of pleopods present.....11.
 Paired pleopods present on first segment only.....14.
11. Gills quadriseriate.....Parapagurus.
 Gills biseriate.....12.
12. Rostrum obsolescent, abdomen twisted.....Sympagurus.
 Rostrum prominent, abdomen straight.....13.
13. Paired pleopods of male followed by three unpaired.....Tylaspis.
 Male lacking unpaired pleopods.....Xylapagurus.
14. Gill pairs 11.....Tomopagurus.
 Gill pairs 13.....15.

15. Male with paired pleopods followed by four unpaired;
gills biseriate.....Tomopaguropsis.
Male with paired pleopods followed by three unpaired;
gills quadriseriate.....Tomopaguroides.
16. Gill pairs 11.....17.
Gill pairs 13.....18.
17. Right chela forming an operculum by itself and/or
covered with spinous or sculptured tubercles.....Pylonagurus.
Right chela not forming an operculum by itself and
never presenting sculptured tubercles.....Ceratopagurus.
18. Three unpaired pleopods present in male..Pylonaguropsis.
Pleopods lacking in male.....Munidopagurus.
19. Eggs carried dorsally.....Porcellanopagurus.
Eggs carried normally.....20.
20. Gill pairs eight, eye scales with four or five terminal
spines.....Octoragurus.
Gill pairs more than eight, eye scales simple.....21.
21. Abdomen twisted, telson and uropods asymmetrical.....22.
Abdomen straight, telson and uropods subsymmetrical..23.
22. Male with three or, rarely, four unpaired pleopods.....Pagurus.
Male lacking paired pleopods.....Paguritta.
23. Abdomen extremely reduced, carapace calcified through-
out.....Ostraconotus.
Abdomen elongate, not particularly reduced; carapace
not entirely calcified.....24.
24. Male with three unpaired pleopods.....Orthopagurus.
Male lacking unpaired pleopods.....Orthopaguropsis.

Genus Anapagurus Henderson

DIAGNOSIS: (After Milne Edwards and Bouvier, 1893)
Chelipeds dissimilar; right short, chela larger and more regularly oval than in Spiropagurus. Left chela similar to that of Pylopagurus, always much more slender and compressed than right chela.

Gill pairs 11; lamellae bifid, phyllobranchiate.
Sexual tube a simple arc. Fourth pereopods not subchelate (as was reported by Milne Edwards and Bouvier); propodal rasp uniseriate. Fifth pereopods subchelate. Left vas deferens short, not forming a complete circle.

Key to Species

Minor cheliped with two dorsal rows of sharp denticles on carpus; a single dorsal row on propodus.....acutus.

Minor cheliped unarmed except for two spines on distal margin of carpus, one on merus.....marginatus.

No specimens have been taken of these two species since they were described. Type material is at the MCZ.

Anapagurus acutus Milne Edwards and Bouvier

Anapagurus acutus Milne Edwards and Bouvier, 1893, p. 120, pl. 9, figs. 7-13. --Gordan, 1956, p. 302.

RANGE: Type locality, off Key West. 24° 15' N., 82° 13'

W.; 152-229 fms.

DIAGNOSIS: (After Milne Edwards and Bouvier) Shield longer than cardiac plate. Lateral teeth short but acuminate; rostrum obtuse. Eyes dilated at cornea, much shorter than frontal margin; stalks sparsely setose above. Eye scales one-fourth as long as eyestalks.

Right cheliped large, chela equal to combined length of merus and carpus. Outer margin of pollex much straighter than that of palm; margins of chela finely denticulate. Carpus of minor chela concave above with a row of spinules on either side. Palm of chela with a dorsal row of sharp spinules; fingers much longer than palm.

Anapagurus marginatus Milne Edwards and Bouvier

Anapagurus marginatus Milne Edwards and Bouvier, 1893, p. 123, pl. 9, figs. 14-18. --Gordan, 1956, p. 303.

RANGE: Type locality, Barbados, 73 fms.

DIAGNOSIS: (After Milne Edwards and Bouvier) Anterior projections of shield subequal, obtuse. Eyestalks a little shorter than the frontal margin. Antennal acicle slender and curved outward, flagellum long and nude.

Right cheliped much larger and stronger than left. Carpus and chela completely unarmed, margins of chela narrow. Left cheliped slender, unarmed except on merus and carpus.

Catapaguroides microps Milne Edwards and Bouvier

Catapaguroides microps Milne Edwards and Bouvier, 1892,
p. 211. --Gordan, 1956, p. 306.

MATERIAL EXAMINED: Two males from Cuba. 20° 49' N.,
75° 08' W.; 600 fms.; Apr. 20, 1939; "Atlantis" sta. 3369;
1 male. 21° 49' N., 76° 43' W.; 910 fms.; Apr. 25, 1939;
"Atlantis" sta. 3379; 1 male.

RANGE: In eastern Atlantic, off northwestern coast of
Spain to Azores and Morocco; 524 to 1540 fms. In western
Atlantic, Cuba, north of Oriente province; 600 to 910 fms.

DIAGNOSIS: Walking legs longer than body; eyes with
cornea much reduced. Right vas deferens short, sabre-
shaped.

DESCRIPTION: Shield convex, smooth, with few setae.
Rostrum rounded, slightly exceeding lateral teeth. Cardiac
plate widest posteriorly; gill cover membranous, expanded.

Eyes half as long as shield, narrowed distally; cornea
pigmented but small; a few anterodorsal setae on stalk
directed forward beyond cornea. Antennular peduncle exceeds
eyes by last two segments; terminal segment equals length of
shield. Second segment of antennal peduncle spined only on
outer angle; acicle exceeds eye by $2/3$; peduncle by $1\frac{1}{2}$
segments. Flagellum equaling legs; feebly setose at each
articulation.

Right cheliped larger and slightly longer than left.

Chelipeds with minute spines only on anteroventral angles. Major chela presents three broad teeth on dactyl meshing with two similar ones on pollex. Cutting edges of minor chela meet along entire surface; edges formed of minute, corneous teeth.

Walking legs very long; dactyls particularly long and laterally compressed; latter with several strong setae forming a distal, double-rowed comb reaching beyond dactylar tips. Second pereopods bear a long, recurved spine (0.8 mm.) on distoventral margin of propodus; spine touching dactyl when latter is reflexed at an angle less than 100 degrees. Four progressively shorter, setose spines appear on either side above longer spine. Dactylar claws reduced; color same as that of setae. Narrow plate between third pair of pereopods presents a comb of short setae.

Propodus of fourth pereopods with a uniseriate rasp on the distal three-fifths of ventral margin, with stout dactyl continuing this rasp to the sharp claw. Fifth pair subchelate, with a hoof-shaped dactyl meeting a blunt pollex. Propodus bears tuft of long hair on lower margin adjacent to feeble rasp on outer, distal half. Vas deferens stout, with shape of broad trough extending somewhat diagonally across opposite coxa and curving forward. Basket-like tuft of long hair projects forward from sternal plate beneath vas deferens. Telson deeply cleft distally; lightly armed.

MEASUREMENTS (mm.): Holotype male; shield, length 2.2, width 2.2; carapace length 3.8; eyes 1.1; major chela, length 3.6, width 1.3, dactyl 1.6; third pereopod, basisischium 1.9, merus 3.0, carpus 2.2, propodus 3.3, dactyl 5.4.

REMARKS: The long dactyls of the walking legs appear to be carried bent beneath the animal, with the propodal spine lending support and the long setae acting as a snowshoe on muddy bottoms. This genus and the species have previously been known only from the eastern Atlantic and Mediterranean.

Genus Catapagurus A. Milne Edwards

DIAGNOSIS: (After Milne Edwards and Bouvier, 1893).

Shield well calcified, broad, short; with lateral projection of margin longer than median. Eyes very short, dilated at cornea. Eye scales well separated, usually long. Antennal flagellum long, nude or nearly so.

First pair of maxillae lacking a palp. Gill pairs 13; formed of two rows of large lamellae.

Right cheliped usually much larger than left. Walking legs slender, rather feeble. Fourth pereopods, described as more or less subchelate, can scarcely be so termed; rasp a single row of denticles. Fifth pair not chelate, but with a well developed rasp.

Male with vas deferens protruding from right side and recurved over right flank. Abdomen twisted and reduced.

Male with four unpaired pleopods, each small and uniramous.

Female with three egg-bearing pleopods biramous, fourth like that of male.

Key to Species

1. Cornea greatly dilated; shield broader than long.....sharreri.

Cornea little dilated; width of shield subequal to length.....gracilis.

Catapagurus gracilis (Smith)

Hemipagurus gracilis Smith, 1881, p. 426.

Cataragurus gracilis Smith, 1883, p. 33. --Gordan, 1956, p. 306.

RANGE: Massachusetts to Barbados; 53 to 155 fms.

DIAGNOSIS: (After Milne Edwards and Bouvier, 1893).

Eye scales much more elongate than in sharreri, considerably surpassing middle of eye stalks. Eyes two-thirds length of frontal margin of shield. Antennular peduncles exceed eyes by terminal segment; those of antennae exceed by half of last segment. Acicle slender, recurved. Flagellum Presents several long setae.

Right cheliped much longer and stronger than left.

Differs from that of sharreri as follows: Much more slender;

carpus with a row of fine denticles above; chela more finely granular, much longer and straighter, lacking clear lines, and with an indentation in propodus at base of dactyl. Left limb attaining middle of chela of right; very slender and with two rows of fine denticles dorsally on carpus.

Walking legs much more slender than in sharreri; dactyls very long. Last two segments of third pereopods much longer than in second pair.

Milne Edwards and Bouvier (1893) also proposed a variety, longimanus, for forms with the major chela especially long and slender, and gave a detailed description of the variety intermedius which was characterized mainly by the chelae being much shorter and more oval in shape.

Catapagurus sharreri A. Milne Edwards

Catapagurus sharreri A. Milne Edwards, 1880, p. 46.

--Gordan, 1956, p. 307.

Hemipagurus socialis Smith, 1881, p. 423.

Catapagurus socialis Smith, 1882, p. 16.

MATERIAL EXAMINED: Holotype male; Barbados; "Blake" sta. 299.

Cuba: North of Oriente province, 20° 46' N., 75° 13' W.; 295 fms.; Apr. 20, 1939; "Atlantis" sta. 3371; 1 ovig. female.

RANGE: Massachusetts to Barbados; 53 to 264 fms.

DIAGNOSIS: (After Milne Edwards and Bouvier, 1893). Shield broader than long, finely setose except in center; gastric region with two lobes anteriorly. Cardiac plate short and narrow. Eyes very short, cornea greatly dilated, reaching middle of penultimate segment of antennular peduncle. Peduncle of antennae exceeding eyes by terminal segment; acicle exceeding by nearly half of length.

Comparisons of pereopods have been given in the diagnosis of C. gracilis.

Genus Ceratopagurus Yokoya

Ceratopagurus cubensis n. sp.

MATERIAL EXAMINED: Holotype female, MCZ 126682; 23° 10' N., 81° 28' W.; 200 fms.; May 11, 1939; "Atlantis" sta. 3480.

RANGE: North of Matanzas Province, Cuba; known only type.

DIAGNOSIS: General appearance typical of genus Pagurus. Chelipeds armed dorsally with numerous spines. Eyes large, swollen distally. Abdomen reduced, a small pair of anterior pleopods present.

DESCRIPTION: Shield glossy; a transverse tuft of setae behind rostrum and each lateral tooth; a line of three punctae with short setae on either side of gastric region. Frontal margin raised between lateral teeth. Rostrum rounded, equal

to lateral teeth; latter each tipped with a minute spinule. Shield projects submarginally from lateral teeth toward eye scales. A long, narrow plate flanks posterolateral edge of shield on either side. Cardiac plate narrow, widest in back; rectangular calcified areas flank this plate in front. Gill covers membranous, fitting closely over gills.

Eyes short, greatly expanded distally. Eye scales broad, with raised edges; tip rounded, with minute subapical spinule. Antennular peduncle short, exceeding eyes by one-third of terminal segment. Antennal peduncle with a minute, subbasal spinule on outer edge. Second segment with external prolongation reaching almost to level of cornea; both angles spine-tipped; terminal segment reaching same level as that of antennular peduncle. Acicle curved outward, spine-tipped, exceeding cornea. Flagellum nude; not reaching tips of legs.

Major cheliped with four sharp spines on anterodorsal margin of merus, three short spines on outer, anteroventral angle. A few tubercles appear on ventralmost part of merus of each cheliped. Carpus and propodus similarly armed on upper surface with numerous spines in somewhat irregular rows; strongest spines on inner edge. Fingers grooved slightly on upper surface. Dorsal ridge runs forward on finger from articulating socket, with a strong, adjacent spine proximally. Fingers close only on distal third of gape; teeth low, irregular.

Minor cheliped slightly shorter than major but appearing longer because of body torsion. Armament similar to that of larger cheliped, with three anterodorsal spines on merus. Fingers meeting throughout gape; cutting edges of fine, corneous teeth, interspersed on pollex with several minute, calcareous teeth. Setae sparse on both chelipeds.

Second pair of pereopods with dorsal row of eight spines on merus, eight~~ten~~ small spines or denticles on propodus. Third pereopods also with eight spines on carpus, but only spinules on propodus. Dactyl of both walking legs with a longitudinal groove on median outer surface. Spinulose setae on distal half of inner dorsal surface of dactyl increase in size and number toward straight, corneous tip.

Propodus of fourth pereopods presents a curved row of over 20 scales on ventral edge while stout dactyl has a row of about 10 very minute scales. Blunt, calcareous tooth appears above terminus of dactylar rasp; recurved, corneous claw rises dorsomedially to this tooth. Propodus of fifth pereopods elongate, chelate, and with a rasp on slightly more than distal half. Ventral edge bears a brush of long, fine setae.

Paired female appendages flat; distal segment slightly spatulate; total length 1.7 mm. End of abdomen missing. A mass of approximately 1,000 eggs, 0.7 mm. in diameter, covers remaining portion of abdomen.

COLOR: After 19 years in alcohol, an orange-red hue of

varying intensity occurs at the following points: Shield, a short distance behind rostrum; eyestalks, increasing in intensity toward black cornea; distally on dorsal and lateral margins of merus of first three pereopods; carpus of walking legs in a longitudinal band on ventrolateral surface; a narrow median stripe on outer surface of propodus, continued in groove of dactyl; a faded stripe on inner surface of merus of second pereopods.

MEASUREMENTS (mm.): Shield, length 7.0, width 7.1; carapace length 12.0; eyes 5.5; major chela, length 13.4, width 6.2, finger 7.0; minor chela, length 11.0, width 3.6; third leg, basis-ischium 5.7, merus 8.5, carpus 5.8, propodus 8.0, dactyls 14.0.

REMARKS: This species is provisionally placed in the genus Ceratopagurus. The only characters which it has in common with Pylopagurus are paired anterior pleopods in the female and 11 pairs of gills. The species can be properly placed only when a male is taken and when the genus Ceratopagurus is more completely described.

Genus Cestopagurus Bouvier

Cestopagurus lineatus

MATERIAL EXAMINED: Holotype male, allotype female, six paratypes (five males and one female), 07° 25' N., 54° 35' W.; 75-80 fms.; Sept. 8, 1958; "Oregon" sta. 2289.

RANGE: Type locality, off Surinam.

DIAGNOSIS: Vas deferens extends straight back for half of length of abdomen. First three pereopods delicately striped. Chelae covered with plumose hairs. Flagellum long, filamentous.

DESCRIPTION: Shield smooth, with a few setose tufts. Obsolescent rostrum slightly exceeding lateral teeth. Eyes swollen slightly near base and at cornea. Six tufts of setae on eyestalk, distalmost extending over cornea. Eye scales small, concave and narrow; subapical spinule set low. Antennular peduncle exceeds eyes by half of terminal segment. Antennal peduncle and acicle slightly exceed eye. Flagellum long, exceeding pereopods by half their length.

Right chela similar to and little longer than left. Both chelipeds with numerous stiff setae, except on chelae, which have exposed surfaces covered with fine, plumose hairs. Carpi and chelae of both chelipeds armed on inner dorsal margins with spinules. Carpi also have two rows of minute spinules near outer dorsal angle. Cutting edges similar on both chelae, those of right member with less sharp edges. Dactyls of both have corneous teeth on less than half of distal edge. Calcareous teeth on remaining edges small.

Walking legs with numerous simple setae, becoming pilose on propodus and dactyl of first leg on left side. Carpi with a distodorsal spinule. Dactyls with ventral row of strong corneous spinules. Fourth pereopods only

feebly chelate; propodal rasp uniseriate. Subchelate fifth propodus with rasp on little more than distal half.

Sternal plate separating third maxillipeds lacking spinules and median suture. Vas deferens straight, conical, at least half as long as ventral surface of abdomen. Male pleopods feebly biramous. Telson small, minutely serrate on margins of median cleft.

COLOR: First three pairs of pereopods longitudinally striped with fine coral lines. Last four segments of each pereopod with scarlet thickenings of regular stripes midway, except more proximally on dactyls of second and third pairs; represented on chelae only by a small inner spot. Head appendages banded at base of eye scales, at each end and midway on eye stalks with irregular blotches of coral. Antennular peduncles with a rose purple band on each of first two segments, two on last segment.

MEASUREMENTS (mm.): Male holotype. Shield, length 4.0, width 4.2; carapace 7.0; eyes 3.7; right chela, length 6.7, width 2.5, dactyl 3.2; third right pereopod, basis-ischium 2.9, merus 5.5, carpus 3.6, propodus 5.7, dactyl 7.7.

Genus Munidopagurus A. Milne Edwards

Munidopagurus macrocheles (A. Milne Edwards)

Eupagurus macrocheles A. Milne Edwards, 1880, p. 40.

Munidopagurus macrocheles Milne Edwards and Bouvier,

1893, p. 103, pl. 7, figs. 21-26.

MATERIAL EXAMINED: Three specimens from Cuba.

Holotype female; off Havana; 175 fms.; "Blake".

Cuba: Bahia de Cochinos; 22° 13' N., 81° 11' W.; 185 fms.; Apr. 4, 1939; "Atlantis" sta. 3320; 1 male. Old Bahama Channel, north of Camaguey Province; 22° 32' N., 78° 08' W.; 220 fms.; Apr. 27, 1939; "Atlantis" sta. 3389; 1 male.

RANGE: Cuba; 175 to 220 fms.

DIAGNOSIS: Body short, abdomen much reduced. Chelipeds equal, narrow, twice as long as body, well armed.

DESCRIPTION: Shield glossy, very convex, with fine setae at four points on each side; one next to rostrum and three in row behind lateral tooth. Rostrum very strong, forming conical spine above level of lateral teeth and exceeding ophthalmic ring. Frontal margin meeting beneath rostrum, raised between lateral teeth. Cardiac plate very short, in shape of an inverted bell; rounded plate on either side bears a prominent tuft of setae.

Eyes short, half as long as shield, moderately swollen distally. Eye scales form long, narrow spines. Antennular peduncle narrow, exceeding eyes by terminal segment. Antennal peduncle exceeds eyes by slightly more than terminal segment; second segment with short spine on inner angle, outer angle setose, not markedly produced; third segment with a spinule on ventral projection. Acicle long, narrow,

unarmed; exceeding eye by one-half. Flagellum nearly reaching tip of major chela; sparsely setose.

Major cheliped normally exceeding minor. Merus flat, concave ventrally, up to 15 strong spines on outer margin, less on inner; spines small and numerous on distal ends of margins. Dorsal surface of merus above ventrolateral margins bears numerous combs of long setae rising from finely dentate escarpments. Carpus thickly set with spines on dorsolateral surface and on inner dorsal and ventral margins. A bare, depressed area on dorsal surface along inner row of spines. Chela presents numerous denticles of varying prominence dorsally. A single strong row of spines on outer margin to end of pollex. Inner margin of hand with a less even row of spines flanked by smaller ones; dactyl presents similar row of low spines and denticles. Fingers closing poorly, cutting edges present teeth apparently adapted for holding; pollex with a strong, finely dentate ridge proximally which terminates in a strong tooth midway. At least 15 low teeth appear along remaining edge. Dactyl with seven teeth on proximal half, evenly decreasing in size distally; distal half with large teeth at three-fifths of distance from apex of cutting edges and at tip of fingers; fine, corneous teeth in intervening gape.

Minor cheliped similar to major; more slender and with sharper spines. Chela with margins of slender spines which disappear distally on fingers. Dorsal surface of palm with

two rows of short spines and tubercles which converge at apex of cutting edges. Latter finely serrate, calcareous proximally, corneous distally, with many calcareous teeth interspersed distally on pollex.

Walking legs compressed from coxa forward. Prominent setae on ventral margins of ischium and merus, and on dorsal margins of carpus and propodus. Dactyl armed with corneous spinules on upper and lower margins.

Fourth pereopods long, compressed; lacking a rasp. Dorsal surfaces of three distal segments densely setose; a prominent tuft on distoventral surface of propodus. Long dactyl slightly upturned at tip, with a minute claw. Long, subchelate propodus of fifth pereopods with a rasp on distal one-fifth and on part of dactyl; fringe of long setae on ventral margin.

Sternal plate separating third maxillipeds presents a median cleft bordered on each side by a strong spine. Male with long tufts of hair bordering coxal openings posteriorly and on intervening sternal segment.

Male abdomen extremely reduced, length about equal to that of thoracic region; flattened to fold under thorax. All pleopods absent in male. Telson and uropods quite symmetrical; exopod with a rasp on distal three-fifths of dorsal margin; endopod reduced to a strong, curved spine; a second stout spine appears at base of this spine. Sixth abdominal segment with a short spine at each posterolateral

angle. Telson unarmed.

MEASUREMENTS (mm.): Shield, length 14.6, width 14.7; carapace length 17.5; eyes 5.8; major cheliped, merus 25.0, carpus 25, chela length 46, width 12.5, finger 17.4; third right pereopod, basis-ischium 6.0, merus 15.8, carpus 10.0, propodus 14.0, dactyl 18.5.

REMARKS: Milne Edwards and Bouvier described the genus Munidonagurus from a single female specimen. The two males taken by the "Atlantis" give further evidence of the aberrantness of this unusual genus. The reduced and flattened abdomen indicate that this species may carry a commensal anemone over its posterior parts. The female type specimen is less well armed on the chelipeds than are the two males. Neither of the males has a perfect set of chelipeds. The large specimen from sta. 3389 is lacking the minor cheliped, while the smaller male from sta. 3320 has the larger one not fully regenerated.

Octonagurus gen. nov.

Type species: Eupagurus pygmaeus Bouvier, 1918, p. 11.

Differs from genus Pagurus principally in presence of only eight pairs of gills instead of 11. No other member of the Paguridae has less than 11 pairs. Gills are phyllobranchiate.

Eye scales broad, quadrate, with five spines on distal

margin whereas Pagurus species from western Atlantic have a single subapical spine on the eye scale. Third maxillipeds widely separated by a sternum bearing a median setose projection. This projection is lacking in the species of Pagurus examined.

Chelipeds well-armed, not markedly unequal; minor chela with cutting edges as in Pagurus.

Telson subsymmetrical; distal lobes separated and armed in a manner similar to that of eye scales.

Octopagurus pygmaeus (Bouvier) n. comb.

Eupagurus pygmaeus Bouvier, 1918, p. 11.

Pagurus pygmaeus Gordan, 1956, p. 335.

MATERIAL EXAMINED: Fourteen specimens from six areas.

South Carolina: 7 miles off Little River Inlet; Aug. 17, 1949; A. S. Pearse; 2 ovig. females.

Off Northwest Florida: Panama City, 50-70 feet, Oct. 13, 1956; G. D. Grice; 1 ovig. female. 29° 16' N., 85° 32' W.; 26 fms.; Feb. 7, 1885; "Albatross" sta. 2369, 1 male.

South Florida: Off Biscayne Key; 16-34 feet; May 19, 1912; Paul Bartsch; 1 male. Tortugas; 80-150 fms.; June 26, 1931; W. L. Schmitt; 1 male. Tortugas; 45 fms.; July 22, 1924; W. L. Schmitt; 1 ovig. female. South of Tortugas; 35 fms.; Aug. 14, 1933; H. H. Darby; 1 male.

Cuba: On reef flat between Cayo Hutia and Little Cayo; Henderson and Bartsch; 1 male, 1 female. Between Cape San

Antonio and Cape Cagon; June 7, 1914; Henderson and Bartsch; 2 ovig. females.

Puerto Rico: Ponce; Jan. 30, 1899; "Fish Hawk"; 1 juv.

Trinidad: Carenage; Aug. 23, 1937; E. Deichmann; 1 male.

RANGE: South Carolina to Trinidad; shallow water to at least 80 fms.

DIAGNOSIS: Small species; legs longitudinally striped. Eyes long, slender, stalks narrowed between base and cornea.

DESCRIPTION: Shield triangulate, well rounded at lateral angles. Rostrum obsolescent but equaling lateral teeth. Cardiac plate broad, bifurcate posteriorly. Eyes shorter than width of shield, swollen at cornea and base. Eye scales broad, with five spines on oblique, distal margin of each. Bases separated but inner spines may meet at tips. Antennular peduncle slightly exceeding eye. Antennal peduncle subequal to eyes; second segment with denticle on inner angle, two or three spinules at apex of outer projection. Acicle slender, setose. Flagellum equaling pereopods.

Chelipeds normal. Carpus of major cheliped armed with a few lateral and distal spines. Chela armed with several short spines on inner margins of propodus and dactyl, with about 15 vertically pointing spines on outer margin. Dorsal surface with two rows of median spinules. Cutting edges with small, even teeth on pollex, corneous teeth on outer third of

dactyl. Minor cheliped with two spinules on inner ventral angle of merus, four on outer. Carpus with several strong lateral and distal spines. Marginal spinules of chela obscured by fine, thick setae which also covers carpus and chela of both chelipeds. Cutting edges fine, corneous, augmented by well-spaced calcareous teeth on pollex.

Walking legs exhibit asymmetry as in Pagurus, those on right side longer. Both pairs armed dorsally only with a distal spine on carpus. Dactyl presents several corneous spinules on ventral margin. Horny claws bent downward. Dorsal and ventral surfaces of both pairs sparsely setose.

Fourth pair of pereopods feebly chelate; dactyl equaling propodus, almost four times as long as pollex portion. Rasp on ventral angle of propodus five scales wide, dactyl with fine row of scales. Propodus of fifth pair with rasp on distal half, including minute dactyl.

Pleopods as in Pagurus. Female from Cape San Blas carried 42 eggs, each approximately 0.5 mm. in diameter. Left uropod much larger than right. Telson less asymmetrical; each terminal lobe with four sharp spinules, the outer recurved.

COLOR: Notes by Paul Bartsch on male from Biscayne Key, "Rose pink with carmine longitudinal stripes between joints, eyes chestnut."

MEASUREMENTS (mm.): Ovig. female from Panama City, Shield, length 3.0, width 2.6; carapace 4.8; eyes 2.5;

right chela, length 3.0, width 1.6, dactyl 1.8, left chela, length 2.7, width 1.2, dactyl 1.5.

REMARKS: When Bouvier described this species from a female specimen in 1918 he realized that it might belong to another genus. However, he apparently did not count the gills and thus failed to realize that it could not be placed in existing genera. The first three pairs of gills have been lost and the fourth is minute. The narrow eyestalks and spinous eye scales cause a superficial resemblance to Clibanarius. No other intertidal pagurid in the area studied was found at as great depths. The range is shown to be extensive but the species is seldom abundant.

Genus Ostraconotus A. Milne Edwards

Ostraconotus spatulipes A. Milne Edwards

Ostraconotus spatulipes A. Milne Edwards, 1880, p. 45.
--Gordan, 1956, p. 321.

MATERIAL EXAMINED: Numerous specimens in type lot at MCZ. The location given for this lot as 26° 31' N., 85° 53' W., is almost certainly an error since the depth at that point would be at least 1700 fms. The depth was given as 119 fms. and this is possibly correct.

RANGE: Gulf of Mexico? to Barbados; 119? to 140 fms.

DIAGNOSIS: (After Milne Edwards and Bouvier, 1893).
Body flattened, carapace calcified throughout; abdomen rudi-

mentary and symmetrical. Walking legs flattened, held out from sides of body and probably adapted for walking on mud.

Genus Pagurus Fabricius

Shield seldom much longer than broad. Rostrum obtuse, never exceeding lateral teeth. Eyes always shorter than shield; dilated at corneas except in a few small forms from littoral waters. Eye scales widely spaced, flattened or with raised margins, latter type usually much narrower; a subapical denticle or spine at tip. Antennular peduncles equaling or exceeding eyes. Peduncles of antennae frequently exceeding eyes; usually armed only on second segment, occasionally with a lateral recurved spinule at base. Acicle lacking teeth along sides. Flagellum nude or nearly so, except in annulines, usually equaling pereopods but shorter in some littoral species and exceeding in those from deep water.

Chelipeds more variable than other parts of body. Right always larger, sometimes operculiform; not forming an operculum when armed with sharp denticles or spines. Cutting edges of major chela with strong calcareous teeth proximally, fine corneous and calcareous teeth distally. Minor cheliped slender but varying considerably between species in size, armanent and proportionate length of dactyl. Cutting edges straight although fingers often curve

downward; teeth fine, corneous except for a few calcareous teeth interspaced on pollex.

Walking legs slender, dactyls always the longest segments, claws sharp. Fourth pair of pereopods only slightly subchelate; propodal rasp composed of a single row of scales or about $1\frac{1}{2}$ rows in most species from deep water, three or more rows in species from littoral or northern waters. Fifth pair chelate, fingers very short.

All species examined have four unpaired pleopods in the female, three in the male. Telson with a deep median cleft in nearly all species; terminal lobes usually armed with spinules on margins.

Genus Pagurus

Key to Species

1. Propodal rasp of fourth pereopods composed of one or two rows of scales.....2.
- Propodal rasp of fourth pereopods composed of more than two rows of scales.....11.
2. Major chela armed with varying numbers of spines on margins.....3.
- Major chela lacking sharp spines on margins.....6.
3. Carpus of major cheliped with sharp spines or denticles dorsally.....4.
- Carpus of major cheliped armed only on margins.....5.
4. Dorsal surface of carpus and chela of major cheliped with plentiful setae.....rubrolineatus.

- Setae lacking on dorsal surfaces of these segments.....cokeri.
5. Major chela armed dorsally with numerous short spines,
a large species.....schmitti.
Major chela with spines only on inner margin, a small
species.....tenuidactylus.
6. Major chela broad.....7.
Major chela narrow.....9.
7. Minor chela with two thin ridges, a dorsal and a lateral
.....curacacensis.
Minor chela comparatively simple.....8.
8. Width of major chela subequal to length, minor chela
with rounded margins, a reef species.....operculatus.
Major chela longer than wide, minor chela with definite
margins, a deep water species.....occlusus.
9. Major chela three times as long as wide.....longimanus.
Major chela less than $2\frac{1}{2}$ times as long.....10.
10. Major chela rounded above and on edges; small species....
.....rotundimanus.
Major chela flattened above, with low, ridges; a large
species.....bullisi.
11. Major chela armed with sharp spines or denticles.....11.
Major chela tuberculate or granular.....16.
12. Eyes dilated considerably at cornea.....defensus.
Eyes dilated only slightly at cornea.....13.
13. Antennal flagella short, with two ventrolateral rows of
long setae.....annulipes.
Flagella long, equaling pereopods, minutely setose...14.
14. Walking legs broadly banded, major chela lacking a
complete row of fine spinules on outer margin, or strong
spines on inner margin.....bonairensis.

- Walking legs striped, major chela with inner and outer margins of spinules, or a row of strong spines near inner margin of hand.....15.
15. Major chela armed with spinules on margins.....brevidactylus.
Major chela armed with a few strong spines on inner dorsal margin of palm.....stimpsoni.
16. Major chela long, granular on ridges.....longicarpus.
Major chela heavy, broader than carpus.....17.
17. Major chela covered with rounded denticles; a deep-water species.....politus.
Major chela with mushroom-like tubercles, much as in Pylodagurus; littoral species.....18.
18. Tubercles of chelae widely separated, rounded, with dentate tips.....pollicaris.
Tubercles of chelae contiguous at edges, completely covering dorsal surfaces. A dimple usually present in each chela.....impressus.

Pagurus annulipes (Stimpson)

Eupagurus annulipes Stimpson, 1859, p. 243.

Pagurus annulipes. ?Behre, 1950, p. 22. --Gordan, 1956, p. 325.

MATERIAL EXAMINED: Thirty-nine specimens from three states.

Massachusetts: Vineyard Sound; 1881; U. S. Fish Commission; 26 males, 7 females.

Georgia: Sapelo Id., Doboy Channel; July 17, 1958; J. M. Teal; 3 females (1 ovig.).

Texas: Port Isabel Ship Channel; Mar. 15, 1947; J. W.

Hedgpeth; 1 male, 2 females, all very small.

RANGE: Massachusetts to Sapelo Id., Georgia; to eight fms. Known in Gulf of Mexico only from coast of Texas.

DIAGNOSIS: Small form. Antennal flagellum short, not exceeding minor chela, with two rows of long, fine setae ventrally. Major chela usually much larger in males.

DESCRIPTION: Specimens from Massachusetts. Shield broad, glabrous, especially on gastric region. Eyes short, not swollen distally. Antennular peduncle exceeding eyes by slightly more than antennal peduncle does. Acicle reaching cornea. Flagellum short, tapering, reaching only to middle of carpus of major cheliped in males from Massachusetts; reaching dactyl of chela in females.

Major cheliped heavy, elongated, in males from Massachusetts. Armament feeble; inner margin of carpus and chela irregularly denticulate, also outer margin of pollex. Face of chela smooth except for two faint rows of minute denticles and fine setae. Fingers gaping to hooked tips, with minute calcareous teeth except for one a little larger near base of dactyl.

Minor cheliped much shorter, often not reaching major chela in males. Carpus armed dorsally with two marginal rows of spinules. Chela similarly armed, with an inner and a mid-dorsal row of spinules. Fingers gaping proximally.

Carpus of first pair of walking legs armed in males with one to eight spinules dorsally on right side, one on

left; females with only a distodorsal spinule. Both walking legs with sparse fine setae; dactyl slender, lacking corneous spinules ventrally. Fourth pereopods with about four rows of scales in rasp. Telson triangularly lobed, armed with minute, straight spinules.

COLOR: Color from life, Woods Hole, 1905, by M. J. Rathbun. Body bright red with light mottlings. Pereopods irregularly marked with transverse bands of brownish red and white. Distal half of chelae white, proximal half red.

MEASUREMENTS (mm.): Specimens from Massachusetts. Shield, length 2.2, width 2.4; carapace 4.2; eyes 1.6; chelipeds; (a-male, b-female) major cheliped, a-10.5, b-5.7, chela, length, a-4.2, b-2.1, width, a-2.0, b-1.2, dactyl, a-2.0, b-1.2; minor cheliped, length, a-6.5, b-4.8; chela, length 2.4, carpus 1.8, propodus 2.9, dactyl 3.5.

REMARKS: Most of the females from Massachusetts show signs of having borne eggs when collected or just before, even though they are considerably smaller than the males. Dimorphism is most evident in the major cheliped. The carpus has several irregular rows of sharp denticles on the dorsal surface. The chela has four dorsal rows plus a complete outer margin of denticles. The extent of this dimorphism in Georgia and Texas has not been observed. The female from Sapelo Is. carries about 150 eggs.

Pagurus bonairensis Schmitt

Pagurus bonairensis Schmitt, 1936, p. 376. --Gordan, 1956, p. 327.

Pagurus annulipes Schmitt, 1935, p. 206. --Behre, 1950, p.22. --Wass, 1955, p. 152.

MATERIAL EXAMINED: Two hundred and seventeen specimens from nine localities.

Mississippi: Horn Id.; Aug. 9, 1950; J. Beale; 2 males.

Florida: Crooked Is. Sound, Apalachicola; Feb. 10, 1936; A. L. Pearse; 11 males, 5 females, ident. by W. L. Schmitt. Sea Horse Key; Apr. 19, 1958; 6 males. Lemon Bay; Jan., 1938; O. Hartman; 106 males, 74 females (46 ovig., 15 with eggs in ovaries). Tortugas, Loggerhead Key, eel grass; July 3, 1932; W. L. Schmitt; 3 males, 1 ovig. female; June 22, 1925; 15-20 feet; 1 ovig. female; June 11, 1925; 20 feet; 1 male, 1 ovig. female.

Cuba: Siguanea Bay; 12-26 feet; Apr. 12, 1931; P. Bartsch; 1 male, 1 juv.

Puerto Rico: Mayaguez; Jan. 19, 1898; "Fish Hawk"; 1 male. Boqueron, East Point Beach, among eel grass; Willis G. Hewatt; 4 males.

Brazil: Isla Govenador, outside mouth of river; Sept. 1, 1925; W. L. Schmitt, 2 males.

RANGE: Mississippi, along northern and eastern edges of Gulf of Mexico, through West Indies to Brazil; to 20 feet.

DIAGNOSIS: Antennal flagellum long, equaling pereopods; almost nude.

DESCRIPTION: Shield smooth on gastric region, convex and feebly setose laterally. Anterior projections obtuse, approximately equal. Eyes shorter than shield, slightly swollen at each end. Eye scales moderately separated. Antennular peduncle exceeding eyes; that of antennae equaling. Flagellum slender, minutely setose at articulations.

Chelipeds feebly armed, with denticles obscured by setae. Carpus and chela of major cheliped with two rows of denticles above, separated by a slightly depressed area. Major chela with a row of denticles on each margin and two median rows on palm. Fingers short, closing almost completely.

Minor cheliped with a few denticles in two dorsal rows. Chela triangular in cross section, finely denticulate dorsally. Fingers gaping in proximal half.

Walking legs with a distodorsal denticle on carpus, corneous spinules on ventral angles of dactyls. Shape and armament of telson similar to that of annulines.

MEASUREMENTS (mm.): Since the specimens examined varied greatly, measurements of four specimens are given in the following table. No. 1, a male from Crooked Is. Sound; no. 2, a male from Sea Horse Key; no. 3, a male from Lemon Bay; no. 4, a female from Lemon Bay. The actual measurements are given for no. 1 and the ratios of each measure-

ment divided by the shield length for this specimen and the other three.

	<u>1</u>	<u>ratio</u>	<u>2(ratio)</u>	<u>3(ratio)</u>	<u>4(ratio)</u>
Shield, length	3.0				
Shield, width	3.0	1.0	0.9	0.9	0.9
Carapace	4.7	1.6	1.7	1.6	1.6
Eyes	2.6	1.9	0.9	1.0	0.8
Major cheliped	9.2	3.7	4.1	5.3	3.5
Chela, length	4.2	1.4	1.4	2.3	1.2
Chela, width	1.6	0.5	0.8	1.0	0.6
Chela, dactyl	1.8	0.6	0.8	1.0	0.6
Minor cheliped	7.5	2.5	2.9	3.4	2.8
Chela, length	3.4	1.1	1.2	1.3	1.0
Chela, width	1.4	0.5	0.5	0.4	0.4
Chela, dactyl	1.8	0.6	0.6	0.7	0.5
Third right pereopod					
Basis-ischium	1.9	0.6	0.6	0.7	
Merus	3.0	1.0	1.0	1.1	
Carpus	2.5	0.8	0.8	0.9	
Propodus	3.5	1.2	1.1	1.3	
Dactyl	4.3	1.4	1.4	1.6	

REMARKS: P. bonairensis exhibits greater variation than any other form encountered in this study. The many specimens from Lemon Bay on the lower west coast of Florida show the most divergence, the males having an unusually large and elongate major cheliped which generally exceeds the walking legs. Also, the latter have the chelae with spinulose rather than denticulate margins while the dorsal surfaces of the carpus and chela bear numerous sharp denticles and a rather thick covering of setae.

The type specimen could not be located at the USNM. The specimens from Crooked Is. Sound were determined by Schmitt and fit his description of the species quite well. Specimens from Lemon Bay differ mainly in the form of the

chelipeds and exhibit as great an amount of sexual dimorphism as specimens of P. annulipes from Massachusetts. Females from Lemon Bay were estimated to carry up to 750 eggs.

Pagurus brevidactylus Stimpson

Eupagurus brevidactylus Stimpson, 1859, p. 91.

Pagurus marshi Benedict, 1901, p. 140, 2 figs.

--Gordan, 1956, p. 331.

Pagurus brevidactylus Gordan, 1956, p. 327.

MATERIAL EXAMINED: Thirteen specimens from seven localities.

Florida (west coast): Sea Horse Key; Nov. 2, 1957; 2 males. Anclote section; 12½ fms.; March 28, 1901; "Fish Hawk" sta. 7106; 1 ovig. female. Cape Florida; Jan., 1925; J. W. Miller; 1 male, 1 female; west of Loggerhead Key; 5-8 ft.; Aug. 3, 1924; W. L. Schmitt, 1 female.

Cuba: 21° 57' N., 82° 33' W.; Apr. 15, 1931; P. Bartsch, 1 ovig. female with an attached Stegophrinx isopod. Cardenas Bay, 2 fms.; Jan. 24, 1957; W. L. Schmitt; 1 female with gravid ovaries.

Puerto Rico: Jan. 30, 1899, "Fish Hawk"; 4 males, 1 ovig. female (types of P. marshi).

RANGE: Sea Horse Key, Fla., to Puerto Rico; to 12½ fms.

DIAGNOSIS: Walking legs longitudinally striped. Eye-

stalks with a low papilla midway on inner surface giving rise to three or four fine setae. Major chela with a row of sharp spinules on outer margin.

DESCRIPTION: Shield glabrous, feebly setose laterally. Rostrum blunt, little in advance of obsolescent lateral teeth. Eyes slender, a notch at base of cornea; latter somewhat bulbous. Stalks present several transverse tufts of setae, largest of which stems from a raised spot midway on inner surface. Scales broad, well separated. Antennular peduncle slightly exceeding eyes, antennae subequal.

Major cheliped armed on merus with a strong spine at inner ventral angle, another at distodorsal angle, three spinules on outer distoventral angle. Carpus armed with a double row of spines on inner dorsal angle, an irregular double row of dorsolateral spinules. Chela with two spines next to inner hinge, sharp denticles more distally, a strong outer margin of vertical spinules, and two dorsal rows of denticles which meet distally. Dactyl with an outer and a dorsal row of fine denticles.

Merus of minor cheliped with two spinules on inner ventral angle, five on outer. Carpus armed above with two irregular rows of spines. Chela triangular above, with spinules on apical ridge; a short row of strong denticles on inner dorsal surface of palm; two rows of fine denticles converging distally on outer side. Fingers gaping proximally.

Walking legs with a few fine setae, a ventral row of ten

fine corneous spinules on dactyls; claws curved down slightly.

COLOR: (from Stimpson) "Color pale reddish; feet with interrupted longitudinal stripes of darker red."

MEASUREMENTS (mm.): Male from Sea Horse Key. Shield, length 2.7, width 2.5; carapace 4.5; eyes 2.5; major chela, length 4.1, width 2.1, dactyl 1.8; minor chela, length 2.8, width 1.2, dactyl 1.9; third right pereopod, basis-ischium 1.2, merus 2.2, carpus 1.9, propodus 2.3, dactyl 2.6.

REMARKS: This species is closely related to P. annulipes, P. bonairensis, and P. stimpsoni, being most near to the latter species. It differs from stimpsoni in having a complete margin of stronger spinules on the outer angle of the major chela, longer eyestalks, shorter antennular peduncles, and shorter dactyls in the walking legs. It is possible that intermediates may be found between these two species, in which case stimpsoni could be no more than a subspecies found at greater depths. The specimens examined fit Stimpson's description, except that the dactyls of the walking legs are a little longer, instead of shorter, than the propodi. Since he gave no actual measurements it is impossible to determine the extent of this difference. The type is not extant.

Pagurus bullisi n. sp.

MATERIAL EXAMINED: Fourteen specimens from coasts of

four Gulf states.

Holotype male; off northwest Florida; 29° 16' N., 86° 10' W.; 125 fms.; Sept. 7, 1955; "Oregon" sta. 1383. Allotype female; off Mississippi; 28° 01' N., 90° 53' W.; 125 fms.; Sept. 21, 1955; "Oregon" sta. 1413. All other specimens are designated paratypes.

Off Texas: 27° 17' N., 96° 25' W.; 75 fms.; Jan. 30, 1939; "Pelican" sta. 111-4, 1 male.

Off Louisiana: 28° 14' N., 91° 41' W.; 39 fms.; July 12, 1938; "Pelican" sta. 84-3; 1 male. 28° 09' N., 91° 32' W.; 49 fms.; July 12, 1938; "Pelican" sta. 85-2; 3 males. 28° 09' N., 91° 27' W.; 50 fms.; July 12, 1938; "Pelican" sta. 85-3; 1 ovig. female. 28° 11' N., 91° 24' W.; 47 fms.; July 12, 1938; "Pelican" sta. 85-4; 2 males.

Off Mississippi: 29° 04' N., 88° 44' W.; 60 fms.; May 24, 1938; "Pelican" sta. 74-3; 1 male.

Off Northwest Florida: 28° 22' N., 89° 59' W.; 65 fms.; Sept. 22, 1955; "Oregon" sta. 1419; 1 male. 29° 47' N., 86° 51.5' W.; 98 fms.; "Pelican" sta. 144-2; 1 male. 29° 34' N., 86° 33' W.; 100 fms.; Sept. 10, 1955; "Oregon" sta. 1396; 1 male in Phalium shell.

RANGE: Northern Gulf of Mexico, Texas to Florida; 39 to 125 fms.

DIAGNOSIS: Largest species of Pagurus in Gulf of Mexico, body up to four inches long. Chelipeds long, narrow, nude except along cutting edges of fingers; major member unarmed

on dorsal surface; both feebly armed on margins. Sharp margins and ridges on fingers extend to tips.

DESCRIPTION: Shield smooth, little rounded; rostrum equaling lateral teeth; a minute spinule on each lateral tooth, none on angled peak of rostrum; margin raised between lateral teeth. Cardiac plate very narrow, bifurcating posteriorly.

Eyes little swollen at base of stalks, much more so at cornea. Eye scales broad, margins upturned; subapical spinule present. Antennular peduncle small, exceeding eyes by two-thirds of terminal segment. Sharp, curved, lateral spine at base of antennal peduncle. Second segment with spinule on inner angle, several on inner edge of outer projection before bifid tip. Terminal segment exceeding eyes by one-half; acicle spine-tipped, exceeding eyes a third. Flagellum nude; exceeding legs.

Major cheliped denticulate on dorsal surfaces; armed with several spines on distoventral and distodorsal margins of merus; carpus with 10-12 spines on inner margin. Hand armed with 15 sharp denticles on inner margin of palm, serrate outer margin of small denticles to tip of pollex, serrate outer margin and dorsal ridge on dactyl. Cutting edge typical of Pagurus, with proximal crushing teeth and distal cutting edges.

Minor cheliped armed dorsally and laterally; meral armament much as in major cheliped; carpus with spines on

inner dorsal margin, outer distodorsal margin and dorsal ridge. Palm of chela produced dorsally, with a few spines on highest part; inner margin dentate, outer margin serrate to tip of long pollex. Margin and dorsal ridge of dactyl granulate, with evenly concave depression between. Fingers with thumb-like corneous tips and typical cutting edges; about 12 tufts of strong setae near each cutting edge form a lattice-work with fingers closed.

Second pereopods armed with spines on dorsal angles of carpus and propodus; third pereopods armed only on distal half of dorsal angle of these segments. Dactyls twisted outward distally, with thick setae on dorsal and ventral margins pointed inward and distally to form a walking surface on inner face. Propodus of fourth pereopods with usual rasp of a single row of broad scales; dactyl with a single row of minute scales. Rasp of fifth pereopods covers distal three-fifths of propodus; one row of scales on dactyl. Unpaired pleopods of male with a prominent external ramus a third as long as internal ramus. Telson asymmetrical; distal lobes with comb-like teeth on outer edges, inner spinules forming a more serrate margin.

COLOR: Merus of first three pereopods marked by diagonal lines of red near the inner distal margins, with less intense color on outer margins. Same color on distoventral half of eyestalks.

MEASUREMENTS (mm.): Shield, length 17.5, width 18.5;

carapace 33.5; eyes 11.5; major chela, length 46, width 21, dactyl 22.5; minor chela, length 37, width 12, dactyl 24.5; third leg, basis-ischium 13, merus 25.5, carpus 19, propodus 25.5, dactyl 41.

Pagurus cokeri Hay

Pagurus cokeri Hay, 1917, p. 73. --Springer and Bullis, 1956, p. 16. --Gordan, 1956, p. 328.

MATERIAL EXAMINED: Four specimens from four stations.

North of Little Bahama Bank: 27° 27' N., 78° 58' W.; 180 fms.; Feb. 2, 1957; "Combat" sta. 235; 1 juvenile. 27° 29' N., 78° 58' W.; 200 fms.; Feb. 2, 1957; "Combat" sta. 236; 1 juvenile. 27° 28' N., 78° 44' W.; 215 fms.; Feb. 2, 1957; "Combat" sta. 237; 1 female.

Caribbean Sea: West of Rosalind Bank; 16° 07' N., 81° 05' W.; 130 fms.; Aug. 24, 1957; "Oregon" sta. 1891; 1 female.

RANGE: Cape Lookout, N.C., Tortugas Ids., Fla. to Caribbean Sea; 130-263 fms.

DIAGNOSIS: Eyes dilated distally. Chelipeds not markedly unequal; carpi and chelae well armed with sharp spines dorsally. Dactyls long, compressed.

DESCRIPTION: Shield roughly quadrate, rostrum rounded, equal to lateral teeth; latter tipped with minute spinules. Raised margins begin on either side of rostrum, extend to lateral teeth. Posterolateral plates of shield long, extending on either side from most lateral to most posterior

part of shield. Cardiac plate narrow, poorly calcified.

Eyes half as long as shield; cornea considerably swollen. Eye scales broad, triangular; concave above; subapical spine present. Antennular peduncle rather small, exceeding eyes by half of terminal segment. Antennal peduncle with minute spinule posterolateral to base; second segment with a spinule at inner angle, five on inner margin of outer projection; terminal segment exceeding eye by two-thirds; acicle exceeding by terminal spine. Flagellum equaling pereopods, nude except for a few stiff setae.

Major cheliped with three distodorsal spines on merus. Carpus and propodus thickly set with sharp spines on dorsal surfaces and margins; largest spines in inner marginal row of carpus, outer row of propodus. Cutting edges of fingers with large teeth proximally; distal edge typical of genus, with curved row of 18 corneous teeth on dactyl meeting several larger, calcareous teeth on pollex. Minor cheliped narrow, nearly as long as major member; armament similar; cutting edges typical, dactyl closing beneath pollex.

Second and third pereopods long, surpassing major cheliped by nearly half of each dactyl. Merus dentate on ventralmost surface. Carpus and propodus armed dorsally with spines and denticles, more strongly so on first leg. Dactyl long, straight proximally, somewhat curved near tip. Two rows of strong, corneous setae on distal fourth of ventral surface apparently aid long, straight claws in walk.

ing on soft surfaces. Propodus of fourth pereopods a row of single scales; dactyl stout, squarish. Propodus of fifth pereopods chelate; rasp on a little more than distal half; dactylar rasp a short row of scales. Telson asymmetrical, unusually armed; finely dentate on outer edges and inner faces of both lobes; small spinules at tips.

COLOR: Apricot on distal margins of merus and on inner dorsal margin of carpus of chelipeds. Merus of second pereopods with same color near distal margin and outer dorsal stripe.

MEASUREMENTS (mm.): Male from "Oregon" sta. 1891; Shield length 10.5, width 11.0, carapace 18.5; eyes 6.2; major chela, length 20.5, width 10.5, dactyl 11.0; minor chela, length 18.8, width 7.0, dactyl 11.0; third leg, basis-ischium 8.0, merus 12.7, carpus 9.5, propodus 11.4, dactyl 24.0.

Pagurus curacaoensis (Benedict)

Eupagurus curacaoensis Benedict, 1892, p. 22.

Eupagurus curaccensis (misspelling) Alcock, 1905, p. 181.

Pagurus curacoensis (misspelling) Gordan, 1956, p. 329.

Pagurus curacaoensis Springer and Bullis, 1956, p. 16.

MATERIAL EXAMINED: Fifteen specimens from five widely separated localities.

Type male, USNM 7835; Curacao; 208 fms.; 1884; "Albatross"

sta. 2125.

Gulf of Mexico: 29° 00' N., 88° 35' W.; 220 fms.; Apr. 22, 1951; "Oregon" sta. 307; 1 male; East of Mississippi River delta, 29° 10' N., 88° 03' W.; 260 fms.; Mar. 13, 1955; "Oregon" sta. 1282; 1 male. 29° 13' N., 87° 54' W.; 250 fms.; June 22, 1956; "Oregon" sta. 1566; 2 ovig. females. 24° 29' N., 83° 27' W.; 212 fms.; June 15, 1956; "Oregon" sta. 1537; 1 male; 24° 42' N., 83° 08' W.; 30 fms.; June 18, 1957; "Oregon" sta. 1553; 1 male; July 31, 1930; 220-237 fms.; W. L. Schmitt; 2 ovig. females. July 8, 1931; 200-253 fms.; W. L. Schmitt; 1 male, 1 ovig. female. July 19, 1932; 295-315 fms.; W. L. Schmitt; 1 male. Aug. 3, 1932; 249-358 fms.; W. L. Schmitt; 1 juvenile. 19° 37' N., 92° 40' W.; 200 fms.; May 15, 1954; "Oregon" sta. 1054; 1 male.

Off mouth of Amazon River: 01° 49' N., 46° 48' W.; 225 fms.; Nov. 17, 1957; "Oregon" sta. 2083; 1 female.

RANGE: Northern Gulf of Mexico to mouth of Amazon River; 200 to 295 fms. (30 fms. record doubtful).

DIAGNOSIS: Major cheliped broad; dorsal surface of carpus denticulate, of chela smooth, with upturned margin. Minor chela small, with prominent, thin plate forming a longitudinal, dorsal ridge.

DESCRIPTION: Shield glabrous, with minute setae at punctae in longitudinal grooves. Rostrum triangular, exceeding rounded, lateral teeth. Cardiac plate narrow, calcified throughout and on adjacent areas of carapace.

Eyes short, little swollen distally. Eye scales prominent, long triangular; convex on upper surface and with a small, subapical spine. Strong antennular peduncle exceeding eyes by terminal segment. Antennal peduncle exceeding by half of terminal segment; second segment with a small spine at inner angle and at tip of long outer projection. Acicle without a spine, exceeding eye by a fourth. Flagellum nude, extremely slender, equal to legs.

Major cheliped operculiform; dorsal and lateral surfaces of merus with low crests; ventral surface denticulate behind crenulate anterior margin. Carpus armed with granules and sharp denticles on dorsal surfaces; lateral margins raised, inner denticulate, outer of eight blunt spines; distal margin of uneven denticles. Dorsal surface of chela very finely granulate; nude except for a few small tufts of setae along gape. Margins heavy, raised, bluntly crenulate. Gape closes throughout; raised, feebly serrate edge in center of pollex culminates in a broad tooth about a third of distance from tip and continues as a sharp edge to four small teeth near tip. Edge of dactyl presents a recession to receive large tooth on pollex, then a rounded tooth next to corneous edge leading to small corneous tip.

Carpus of minor chela armed with two dorsal rows of spines and denticles; outermost row meets apex of distal recession in margin; latter presents a strong spine on each side. Propodus with a raised, somewhat wavy crest on dorsal

surface to tip of pollex and a similar crest at lateral margin, with a broad depression intervening. A few low denticles line inner margin of palm and adjacent edge of dactyl, with four others on proximal end of low dorsal ridge of dactyl. Cutting edge of typical, fine corneous and calcareous teeth on pollex meeting even corneous edge of dactyl.

Walking legs spinulose on dorsal angle of carpus, denticulate on that of propodus. Dactyl with a few short setae on inner dorsoventral edge; strongest near short, amber tips. Rasp on propodus of fourth pereopods composed of two rows of scales; short dactyl with a fine rasp in line with tip of claw. Chelate propodus of fifth pereopods with a rasp on distal half.

External ramus of unpaired pleopods stronger than usual, up to a third of length of internal ramus. Uropods and telson strongly asymmetric; triangular distal lobes well armed on inner borders; spinule at each tip curved outward.

COLOR: A striking pattern of orange color in varying intensity appears on bases of eyestalks, eye scales, second segment of antennal peduncle, acicle, anterior margins of merus and carpus of chelipeds and on walking legs at proximal and distal ends of all segments beyond coxa except carpus, which has only a distal band. Dactyl yellow proximally on ventral and dorsal margins, distal third orange.

MEASUREMENTS (mm.): Shield, length, 8.0, width 7.5;

carapace 13.0; eyes 4.0; major chela chela, length 17.7, width 12.0, dactyl 8.0; minor chela, length 9.8; width 5.2, dactyl 6.0; third leg, basis-ischium 6.0, merus 8.2, carpus 7.1, propodus 7.6, dactyl 12.8.

Pagurus defensus (Benedict)

Eupagurus defensus Benedict, 1892, p. 7.

Eupagurus dissimilis A. Milne Edwards and Bouvier, 1893, p. 146, pl. 10, figs. 19-25;

Pagurus dissimilis Gordan, 1956, p. 329.

Pagurus defensus Gordan, 1956, p. 329.

MATERIAL EXAMINED: Fourteen specimens from six localities.

Alabama: 29° 45' N., 87° 45' W.; 21 fms.; Mar. 1, 1939; "Pelican" sta. 136-2; 1 male.

North Carolina: Off Cape Lookout; 22 fms.; 1885; "Albatross" sta. 2609, 1 male.

Florida (east coast): Off Daytona, 29° 20' N., 80° 15' W.; 35 fms.; June 2, 1957; "Combat" sta. 345, 1 male, carapace length 17 mm. 18 mi. southwest of Destin, Fla.; 18-20 fms.; Oct., 1941; T. J. McGinty, 2 males.

Florida: 29° 28' N., 85° 31' W.; 12 fms.; Feb. 1, 1956; "A. A. Jakkula"; 3 males, 3 females (1 ovig.).

Tortugas: 40-45 fms.; Paul Bartsch; 1 male. 16 fms.; J. B. Henderson; 1 male.

Yucatan Bank: Alacran Reef, 20 fms., "Blake" sta. 38, 1 male (type of Eupagurus dissimilis A. Milne Edwards and Bouvier).

RANGE: North Carolina to Florida, Gulf of Mexico; 12 to 40 fms.

DIAGNOSIS: Eyes subequal to shield; chelipeds armed mainly on margins, setose dorsally. Antennal flagellum nude, exceeding pereopods.

DESCRIPTION: Shield small, quite flattened; rostrum obsolescent, considerably exceeded by triangular lateral teeth. Eyes large, dilated distally. Eye scales broad, flat, rounded anteriorly, each with subapical spinule. Antennular peduncle exceeding eye by two-thirds of terminal segment. Second segment of antennal peduncle dentate on inner angle, outer projection terminating in a spine. Terminal segment slightly exceeding eye; flagellum nude, considerably exceeding pereopods.

Faces of chelae covered with mushroom-like tubercles on distal half, each tubercle tipped with a short spine or denticle. Meri of chelipeds spined distally on dorsal and ventral margins. Carpus of major chela with a median dorsal and an inner dorsal row of eight spines each, with several spines between these rows and numerous spinules on outer dorsal surface. Carpus of minor chela narrow, with two rows of sharp spines dorsally. Both chelae with two converging rows of spines on dorsal surface and marginal rows of sharper

spines. Mushroom tubercles begin at termination of converging rows of spines. Fingers fairly typical, gape absent on both hands. Cutting edges of dactyl with more, and stronger, calcareous teeth than usual in genus. Tips calcareous on large hand, corneous on small. Carpi and chelae covered with fine, dense setae dorsally.

Carpus of second pereopods with eight to ten spines on dorsal angle, 11 to 13 on that of propodus. Carpus and propodus similarly armed on third pereopods, but with spinules and denticles. Dactyl rounded on outer surface, more flattened on inner; a fine longitudinal groove on each. Dorsal and ventral rows of setae on dactyl directed inward.

Fourth pereopods with a ventral rasp three scales wide on propodus. Dactylar rasp of 11 scales increasing in size distally; tip strong, curved. Fifth pereopods with a rasp on outer distal half. Telson well armed on triangular terminal lobes, especially on outer margins.

COLOR: Eye stalks shading from light purple at constricted part to deep purple near black cornea. Surfaces of chelipeds apricot, with spines salmon to coral pink. Two convergent rows of spines on each cheliped white on smaller specimens.

MEASUREMENTS (mm.): Shield, length 6.5, width 7.3; carapace 14.0; eyes 5.5; major chela, length 14.0, width 7.8, dactyl 6.6; minor chela, length 10.6, width 4.5, dactyl 5.8; third pereopod, basis-ischium 4.7, merus 8.5, carpus

6.8, propodus 8.5, dactyl 15.8.

Pagurus impressus (Benedict)

Eupagurus impressus Benedict, 1892, p. 5.

Pagurus impressus Wass, 1955, p. 152. --Gordan, 1956, p. 330.

MATERIAL EXAMINED: Fifty-eight specimens from four states.

North Carolina: 34° 33' N., 76° 41' W.; 9 fms.; Feb. 12, 1940; "Pelican" sta. 185-5; 1 in shell of Polynices.

South Carolina: 33° 33' N., 77° 42' W.; 9 fms.; Feb. 15, 1940; "Pelican" sta. 184-7; 1 in shell (a tunicate had made a dwelling of sand grains on the lip of the shell, with a tiny flat stone forming a roof over the walls of agglutinated sand grains). 32° 49' N., 79° 28' W.; 6 fms.; Feb. 12, 1940; "Pelican" sta. 182-15; 1 ovig. female, 1 male in Busycon shell.

Georgia: 31° 58' N., 80° 44' W.; 6½ fms.; Feb. 3, 1940; "Pelican" sta. 181-1; 1 in Strombus shell. 31° 07' N., 81° 05' W.; 7 fms.; Jan. 31, 1940; "Pelican" sta. 178-3; 2 in shells. 31° 01' N., 81° 10' W.; 7 fms.; Jan. 26, 1940; "Pelican" sta. 177-12; 1 ovig. female, carapace length 8 mm. 30° 56' N., 81° 00' W.; 10 fms.; Jan. 26, 1940; "Pelican" sta. 177-10; 2 males, larger with carapace length 27 mm.

Florida (east coast): 28° 45' N., 80° 27' W.; 10 fms.;

Jan. 19, 1940; "Pelican" sta. 171-2; chelipeds and walking legs.

Florida (west coast): Cape San Blas, 29° 28' N., 85° 31' W.; 12 fms.; Feb. 1, 1956; "A. A. Jakkula", 1 ovig. female, carapace length 7.5 mm. Apalachee Bay, 8 mi. south of Ochlockonee River; Mar. 10, 1957; George D. Grice; 2 males. 21 3/4 mi. northeast of Cedar Key Light, 5 3/4 fms.; Jan. 11, 1913; "Fish Hawk" sta. 7807; 1 juvenile. Tampa Bay; 5 fms.; Apr. 1, 1901; "Fish Hawk" sta. 7117, J. E. Benedict; 15 males, 26 females (11 ovig.). Off Cape Sable, 25° 10' N., 82° 22' W.; 3 3/4 fms.; Dec. 17, 1902; "Fish Hawk" sta. 7352; 1 male.

RANGE: North Carolina to Cape Canaveral, Fla., on Atlantic coast; Cape Sable, Fla. to Texas in Gulf of Mexico; intertidal to 12 fms.

DIAGNOSIS: Chelipeds similar, right little larger than left; face covered with plates as in some Pylopagurus. Chelae with a deep dimple between base of dactyl and outer margin.

DESCRIPTION: Shield smooth medially, flattened. Eyes short; cornea much broader than base of stalk. Eye scales broad, rounded; subapical spine minute. Eyes exceeded by antennular peduncle, equaled by that of antenna. Acicles barely reaching cornea. Flagellum nude, equaling pereopods.

Chelae with prominent ridges and depressions. Surface plates rounded, much smaller in depressions than on ridges.

Margins armed with blunt teeth which point upward and outward. Prominent depressions include a central dimple and a proximal groove separated from inner margin by a ridge.

Walking legs flattened, particularly in dactyl. Latter with a fine longitudinal groove on inner side. Propodal rasp of fourth pereopods with about six rows of fine scales. Telson very asymmetric, left lobe armed with straight, calcareous teeth; median indentation scarcely marked.

MEASUREMENTS (mm.): Male from Apalachee Bay. Shield, length 11.5, width 11.3; carapace 2.8; eyes 9.5; right chela, length 25.0, width 16.0, dactyl 16.0; left chela, length 19.0, width 13.0, dactyl 11.0; third right pereopod, basis-ischium 8.5, merus 12.5, carpus 11.2, propodus 10.7, dactyl 19.0.

Pagurus longicarpus Say

Pagurus longicarpus Say, 1817, p. 163. --Wass, 1955, p. 152. --Gordan, 1956, p. 331.

Pagurus truncatulus Rafinesque, 1817, p. 47.

Eupagurus longicarpus Stimpson, 1858, p. 237.

Eupagurus longipes Coues, 1871, p. 124.

Dardanus truncatulus Gordan, 1956, p. 316.

MATERIAL EXAMINED: Nine specimens from two states.

Chesapeake Bay: Off Kiptopeke Ferry landing; 80-90 ft., Feb. 15, 1955; Virginia Fisheries laboratory; 2 males.

Florida: Off Jacksonville; 30° 25' N., 81° 18' W.; 8 fms.; Jan. 25, 1940; "Pelican" sta. 176-1; 1 in shell. West coast, Sea Horse Key, south side of beach at low tide; Sept. 29, 1957; Doyle Folks; 6 males.

RANGE: Massachusetts to Florida; Texas to lower west coast of Florida; to 18 fms.

DIAGNOSIS: Chelipeds long and narrow, surfaces granular; low dorsal ridge on carpus and chela.

DESCRIPTION: Shield broad, rather flat. Eyes short, stout, swollen distally; two rows of minute setae above. Eye scales typical, strong. Antennular peduncle weak, equaling that of antenna. Flagellum of latter nude, equaling pereopods.

Major cheliped considerably larger than minor; both unarmed. Median dorsal ridges of carpus and chela marked by low, spaced tubercles or granules. Outer margin of pollex on right chela serrate. Minor chela curved downward; slight proximal gap in cutting edges.

Walking legs slender; dactyl long, curved outward at tips to form walking surface; claw weak. Propodal rasp of fourth pereopods with three or four rows of minute scales. Telson subsymmetrical, well armed with calcareous spinules distally.

COLOR: Indian red longitudinal stripes on dorsal ridges of chelipeds, both sides of carpus of chelipeds, also

on sides of carpus and propodus of walking legs. Oblique stripes of same color distally on both sides of carpus of all pereopods and in a proximal transverse band on outer surface of carpus of second walking leg. A patch of red chromatophores on inner side of terminal segment of antennal peduncle. First three pereopods with a metallic green sheen dorsally on merus and carpus. Varying shades of blue, brown, and green in broken lines and blotches covering carapace and both ends of abdomen.

MEASUREMENTS (mm.): Male from Sea Horse Key. Shield, length 6.0, width 6.2; carapace 11.0; eyes 4.5; major chela, length 13.5, width 5.0, dactyl 6.0; minor chela, length 8.4, width 3.2, dactyl 4.5; third right pereopod, basis-ischium 3.8; merus 8.0, carpus 6.0, propodus 7.5, dactyl 13.3.

Pagurus longimanus n. sp.

MATERIAL EXAMINED: Male holotype; off Cayenne, French Guiana; 05° 57' N., 52° 20' W.; 28-31 fms.; Sept. 11, 1958; "Oregon" sta. 2307.

RANGE: Known only from type.

DIAGNOSIS: Eyes stout and short. Major chela knife-like, longer than abdomen.

DESCRIPTION: Shield broader than long, flattened. Lateral teeth exceeding obsolescent rostrum. Eyes short, heavy; expanded distally. Eye scales concave, triangular;

subapical spinule minute. Antennular peduncle with terminal segment beginning at base of cornea. Antennal peduncle shorter, acicle equaling eye. Flagellum slender, nude, reaching major manus.

Right cheliped long, exceeding walking legs. Merus and carpus heavy. Dorsal surface of carpus covered with transversely lobed denticles; inner dorsal margin with a few strong denticles interspersed with much smaller ones; outer margin evenly granular. Chela much longer than carpus, subequal in width, less than two-thirds as thick. Dorsal surface low convex, feebly granular, with an even margin of united granules. Fingers flattened; cutting edges sharp, mainly of fine, calcareous teeth.

Minor chela missing. Walking legs slender, armed with dorsal crests of spinules on carpus; merus faintly crested. Dactyl slightly setose distally on dorsal and ventral angles; tips minute. Propodus of fourth pereopods with a uniseriate rasp; propodus of fifth chelate, with rasp on distal half. Unpaired pleopods uniramous. Telson small, distal lobes finely spinulose on margins.

COLOR: Eyes with black cornea; eyestalks, eye scales, shield, and peduncles of antennae and antennules with dark gray chromatophores beneath the surface. Major chela orange rufous in a broad dorsal stripe. Carpus of major chela mottled with ferruginous dorsally. Propodus of walking legs with latter color in three longitudinal stripes on suffused

background of same color.

MEASUREMENTS (mm.): Shield, length 4.0; width 5.0; carapace 8.0; eyes 3.2; right chela, length 13.8, width 4.5, dactyl 5.6; third right pereopod, basis-ischium 2.4, merus 6.2, carpus 4.7, propodus 5.7, dactyl 10.2.

Pagurus operculatus (Stimpson)

Eupagurus operculatus Stimpson, 1859, p. 92, pl. 1, figs. 9, 10.

Pagurus operculatus Gordan, 1956, p. 333.

MATERIAL EXAMINED: Key Largo, Fla., Carysfort Light; Aug. 14, 1948; D. Moore and P. Lyman; 1 male.

RANGE: Florida Keys and Tortugas Ids.

DIAGNOSIS: Major cheliped unusually heavy and broad, forming an operculum by itself. Minor chela no heavier than walking legs. Major chela nearly as broad as long, granular on face and very white.

DESCRIPTION: Shield glabrous, with a few minute setae. Cardiac plate broad. Eyes short, moderately dilated at cornea, curved out and with a row of setae in four tufts above; a fifth tuft on inner surface. Eye scales narrow, margins raised, subapical spinule very minute. Antennular peduncles equaling those of antennae and exceeding eyes. Flagellum slender, nude, equaling major cheliped.

Right cheliped exceeding walking legs, greatly swollen

in merus, carpus, and chela. Carpus armed with a few spinous denticles on inner margin; face sparsely granular with outer margin a fine line of granules. Major chela with face finely granular; margins produced upward and outward, edges scalloped. Dactyl short, somewhat subchelate, with a beaded dorsal ridge.

Minor cheliped feeble; just reaching major chela. Carpus armed with five dorsal spines and one distoventral. Chela narrow, little longer than carpus. Walking legs glabrous, nearly nude; carpus with a distodorsal spine. Dactyl short, with six corneous spines on ventral angle. Claws strong, curved downward. Fourth pereopods with a single row of scales in propodal rasp. Telson subsymmetrical, with straight spinules on inner margins of distal lobes.

MEASUREMENTS (mm.): Shield, length 5.0, width 5.0; carapace 8.5; eyes 3.8; major chela, length 7.9, width 7.8, dactyl 4.3; minor chela, length 4.6, width 1.4, dactyl 2.5; third right pereopod, basis-ischium 3.2, merus 5.1, carpus 4.2, propodus 4.8, dactyl 5.5.

COLOR: Specimen in alcohol for 10 years. Lateral areas of shield maculated with red and white. A white spot surrounded by red just behind each eye scale. Eye stalks with a red band midway except on ventral surface. Eye scales white except for a narrow margin of red at bases. Antennular peduncle with a broad red band on each of last two segments.

Merus and carpus of major cheliped maculated with white

and red dorsally and laterally; spinules and denticles white. Major chela strikingly white above. Minor chela and walking legs uniform buff-orange with some white patching on meri.

REMARKS: According to Provenzano (in litt.), who has examined the only female specimen taken, this species belongs in the genus Pagurus. However, Pagurus roseus Benedict, from the Gulf of California, which is very close to P. operculatus, does belong in the genus Pylropagurus. Examination of additional females may show that operculatus also belongs in the latter genus.

Pagurus politus (Smith)

Eupagurus politus Smith, 1882, p. 12, pl. 2, fig. 5.

Eupagurus smithii A. Milne Edwards and Bouvier, 1893, p. 140, pl. 10, figs. 1-12.

Eupagurus bouvieri Faxon, 1895, p. 57.

Pagurus bouvieri Gordan, 1956, p. 327.

Pagurus politus Gordan, 1956, p. 333.

MATERIAL EXAMINED: One hundred and thirty-four specimens from three general areas.

Off Georgia: Between $34^{\circ} 41' - 33^{\circ} 31' N.$, and $75^{\circ} 31' - 76^{\circ} 35' W.$; 180-230 fms.; June 14-16, 1957; "Combat" stas. 356-369; 10 males, 2 females (1 ovig.).

Off Northeast Florida: $30^{\circ} 32' N.$, $90^{\circ} 19' W.$; 23 fms.;

Jan. 10, 1957; "Combat" sta. 201; 1 male in shell of Sipho stimpsoni. 29° 55' N., 80° 10' W.; 180-220 fms.; Dec. 5, 1956; "Combat" stas. 185-7; 4 males, 5 females (2 ovig.). 29° 48' N., 80° 12' W.; 130 fms.; Sept. 1, 1956; "Combat" sta. 82; 21 males, 9 females. 29° 36' N., 80° 07' W.; 210 fms.; Sept. 12, 1957; "Combat" sta. 501; 2 males from Scaphella gouldiana; 29° 34' N., 80° 23' W.; 25 fms.; June 2, 1957; "Combat" sta. 349; 5 males (1 with gooseneck barnacle attached to shield). Between 30° 04'-29° 14' N., and 80° 13'-80° 05' W.; 135-220 fms.; Nov. 20-25, 1957; "Silver Bay" stas. 212-230; (51 specimens from 14 stations), 35 males, 16 females (7 ovig.). 28° 56' N., 80° 01' W.; 100 fms.; Mar. 29, 1940; "Pelican" sta. 204-4; 1 ovig. female. 28° 08' N., 79° 54' W.; 100 fms.; Mar. 30, 1940; "Pelican" sta. 205-5; 1 female.

South Florida and Tortugas: 25° 12' N., 80° 00' W.; 185 fms.; July 25, 1957; "Combat" sta. 453; 5 males, 1 female. 25° 04' N., 80° 02' W.; 180 fms.; July 22, 1957; "Combat" sta. 440; 2 males. 24° 13' N., 81° 42' W.; 300 fms.; July 21, 1957; "Combat" sta. 436; 4 males, 2 females. 24° 33' N., 83° 34' W.; 200-300 fms.; July 9, 1955; "Oregon" sta. 1328; 1 male, 1 female. 24° 28' N., 83° 29' W.; 220 fms.; June 15, 1956; "Oregon" sta. 1541; 1 male. 24° 28' N., 83° 28' W.; 210 fms.; June 16, 1956; "Oregon" sta. 1543; 1 male, 1 female. South of Tortugas; 110 fms.; July 15, 1930; W. L. Schmitt; 1 male; same area; 135-156 fms.; July 2, 1932;

W. L. Schmitt; 1 male, 1 ovig. female.

RANGE: Massachusetts to Straits of Florida and Dry Tortugas, 100 to 300 fms. in area studied (25 fm. record doubtful); 55-365 fms. off New England.

DIAGNOSIS: One of larger species in genus, up to six inches including chelipeds. Latter armed only with short spines and numerous denticles.

DESCRIPTION: Shield broader than long, flattened; rounded lateral teeth exceeding blunt rostrum. Eyes shorter than shield, swollen at cornea; line of setae on dorsal surface from scale to recessed spot in cornea. Antennular peduncle short, exceeding eye by half of terminal segment. Antennal peduncle slightly exceeding eye, second segment with a minute spinule on inner angle and three or four on inner margin of outer projection. Flagellum equaling legs, nude.

Chelipeds not markedly different. Merus of major cheliped serrate on distodorsal margin; spinulose on disto-ventral outer angle. Dorsal surface of carpus covered with sharp denticles; latter form a row on inner margin. Chela covered with small, blunt denticles. Cutting edges typical; fingers gaping except at tips. Carpus of minor cheliped with dorsal margins of sharp denticles evenly separated by a flat, glabrous strip. Latter narrowed distally by short row of four denticles next to outer margin. Minor chela dorsally triangular with apex of ridge extending to tip of

pollex. Denticles cover dorsal surface of palm and pollex, forming two prominent rows on proximal part of ridge. Cutting edge of pollex with fewer calcareous teeth than usual. Tip of dactyl covered completely by that of pollex when closed.

Second and third pereiopods feebly armed with denticles on dorsal surface. Dactyls long, concave on proximal inner surface; flat triangular on remaining length. Ventral angle sharp, fringed with blunt, corneous spinules; fringe of longer, stiff setae, usually much worn, occurs on disto-dorsal margin. Distal, outward twisting apparently allows inner surfaces to be used as walking surfaces.

Propodus of fourth pereiopods with a ventral rasp four scales wide; very minute scales compose dactylar rasp. Propodus of fifth pereiopods with rasp covering upper two-thirds of distal half. Dactyl bears a dorsal rasp two scales wide; cup-shaped lower surface of dactyl fringed with a corneous comb of teeth which closes over a much smaller opposing comb. Unpaired pleopods of male with a small external ramus. Telson markedly asymmetric; armed with recurved, corneous spinules.

COLOR: General hue of salmon on first three pairs of pereiopods, most intense on dorsal and lateral surfaces of merus of pereiopods on right; more distal segments and left pereiopods with more white in background, deepest color on leading edges of denticles.

MEASUREMENTS (mm.): (Male from "Silver Bay" sta. 230) Shield, length 12, width 14; carapace 25; eyes 9.5; major chela, length 30.5, width 14, dactyl 15; minor chela, length 24, width 9.5, dactyl 14.5; third right pereopod, basis-ischium 8.5, merus 16.5, carpus 14.5, propodus 14.5, dactyl 28.

REMARKS: Milne Edwards and Bouvier described Eupagurus smithii from five female specimens taken in the Straits of Florida. While the measurements given by these authors indicate some differences in dimensions of the chelipeds, a comparison of certain ratios derived from measurements given for types of smithii and politus with those from eight specimens taken off the eastern and southern coasts of Florida and south of the Tortugas indicate that this species varies greatly in this area. Ranges of these ratios are given in the following table.

	Types of <u>smithii</u>	Types of <u>politus</u>	Florida <u>politus</u>
Carapace/ Rt. chela	1.04-1.03	0.87-0.95	0.86-1.06
Rt. chela Length/width	1.51-1.65	2.04-2.10	1.80-2.18
Carapace/ Third dactyl	1.12-1.12	0.83-0.86	0.84-1.12

While the chelae of the smithii types are heavier than any others measured, the variation of 1.80-2.18 in two specimens from "Oregon" sta. 1328, the same general area as the

types were from, would seem sufficient evidence for reducing smithii (equals bouvieri) to synonymy.

This species is the most abundant pagurid taken off the eastern coast of Florida in experimental trawling for Hymenonema robustus Smith. In the Gulf of Mexico its range apparently extends only to the Dry Tortugas.

Pagurus pollicaris Say

Pagurus pollicaris Say, 1817, p. 162. --Behre, 1950, p. 22. --Gordan, 1956, p. 333.

Eupagurus pollicaris Stimpson, 1858, p. 237.

Eupagurus floridanus Benedict, 1892, p. 5.

Pagurus floridanus Behre, 1950, p. 22. --Wass, 1955, p. 152. --Springer and Bullis, 1956, p. 16. --Gordan, 1956, p. 329.

MATERIAL EXAMINED: Fifty-three males, 12 females, ten in shells, from the coasts of seven states.

Massachusetts: Nantucket, 1853; 2 large males, MCZ 521 (one with carapace length 23.5 mm.).

South Carolina: 32° 55' N., 79° 29' W.; 5 fms.; Feb. 12, 1940; "Pelican" sta. 182-17; 3 in shells. Charleston, 1852; 1 male, MCZ 12801.

Georgia: 32° 00' N., 80° 34' W.; 8 fms.; Feb. 3, 1940; "Pelican" sta. 181-3; 2 in shells. 31° 08' N., 81° 05' W.; 7 fms.; Jan. 31, 1940; "Pelican" sta. 178-3; 1 ovig. female. Sapelo Id.; May 30, 1957; 1 male, 2 females; July 10, 1957;

6 males, 1 female; J. M. Teal.

Florida (east coast): 30° 25' N., 81° 19' W.; 8 fms.; Jan. 25, 1940; "Pelican" sta. 176-1; 1 male, 1 ovig. female, 2 in shells. 28° 24' N., 80° 33' W.; 6 fms.; Apr. 4, 1940; "Pelican" sta. 207-3; 2 in shells.

Texas: Lydia Ann Channel; 6 males. Mud Id.; 1 male. Port Isabel; 1 male; H. H. Hildebrand.

Louisiana: Isle of Brittain, mouth of Mississippi; "Rec'd. May 30, 1860; C. S. Pierce; 1 in shell, MCZ 1055.

Alabama: Mobile; Apr. 1850; A. Agassiz; 1 ovig. female.

Florida (west coast): Cape San Blas; 4½ fms.; Feb. 1, 1956; "A. A. Jakkula"; 1 ovig. female, carapace length 6.3 mm., carrying about 1500 eggs, each .4 mm. in diameter. Sea Horse Key, south side beach at low tide; Sept. 21, 1957; 20 males; grass flats; Oct. 8, 1957; 5 males, 2 females; Nov. 15, 1958; 6 males, 2 females; D. Folks. Egmont Key; W. L. Coons, 1 male, USNM 997. Charlotte Harbor; W. H. Dall; 1 male, USNM 12448, type of P. floridanus. Charlotte Harbor; 1850; 1 male, 1 ovig. female; MCZ 470.

RANGE: Massachusetts to Florida (Cape Canaveral); to 14 fms. (Cape Cod); Texas to west coast of Florida (exact limits not known but apparently not found at Key West or Dry Tortugas); to 4½ fms.

DIAGNOSIS: Chelipeds heavy, right much larger than left. Chelae nude; faces covered with low peaked denticles varying in size and more or less separated. Dorsal and

inner surfaces of palm and chela form an obtuse angle.

DESCRIPTION: Shield small, shorter than cardiac portion. Rostrum subequal to lateral teeth. Eyes little shorter than shield; a little thicker at cornea than at bases, narrowed in midsection. Peduncle of antennule exceeding eyes by half of distal segment, that of antennae exceeding by a fourth. Acicle unarmed, reaching cornea. Flagellum nude, equaling pereopods.

Merus of major chela armed with six spines on distal margin; carpus with short, blunt spines on inner dorsal margin. Remaining dorsal surface of carpus with sparse setae partially obscuring irregular rows of denticles. Chela with an outer margin of strong teeth in somewhat serrate outer margin. Inner margin raised, supporting irregular denticles with round bases and blunt tips. Dorsal surface covered thickly with similar denticles, rounded on palm, polygonal and more closely spaced on fingers.

Minor cheliped armed on carpus with strong denticles in two irregular rows above. Chela with strong blunt teeth on outer margin, many short denticles on inner angle of palm. Dorsal surface as in major member. Dactyl with two rows of even, round denticles along median margin.

Carpus of first walking legs with several spines on dorsal crest; propodus of first and carpus of second with sharp denticles above. Dactyl comparatively slender and long. Propodus of fourth pereopods with six rows of scales in rasp.

Telson subsymmetrical, fringed with sharp spines on triangular distal lobes.

COLOR: Fresh specimens from Sea Horse Key, Fla. Body and pereopods peppered with prune purple. Same color on eyestalks behind navy blue corneas. Setae on antennular flagellum with a subproximal line of flaming maple which diffuses on either side. Lavender in varying intensity in denticles on faces of chelae. Flaming maple outlines denticles bordering cutting edges of fingers.

MEASUREMENTS (mm.): Male from Sea Horse Key. Shield, length 11.5, width 11.7; carapace 24.0; eyes 9.5; major chela, length 24.0, width 15.5, dactyl 11.7; third right pereopod, basis-ischium 8.5, merus 13.4, carpus 11.5, propodus 11.5, dactyl 21.7.

REMARKS: Benedict described P. floridanus from specimens taken on the Gulf coast of Florida, stating that the hands were much narrower than in pollicaris. Ratios of width over length of major chela in 13 specimens from Massachusetts, Charleston, and Sapelo Id. show a range of .61 to .73, while ratios of the same measurements in 15 specimens from Texas, Louisiana, Alabama, and the west coast of Florida range from .54 to .74. This wide variation in specimens from both areas seems sufficient evidence, along with observed variation in the points mentioned by Benedict, to place floridanus in synonymy. This is one of several species which apparently have a discontinuous

distribution around the tip of Florida.

Pagurus rotundimanus n. sp.

MATERIAL EXAMINED: Twelve specimens from two localities.

Dry Tortugas: Holotype, male; $24^{\circ} 20' N.$, $83^{\circ} 20' W.$; 190 fms.; Apr. 13, 1954; "Oregon" sta. 1005. Allotype female (ovig.); 16 mi. south of Tortugas; 197 fms.; Aug. 1, 1932; W. L. Schmitt. All other specimens are designated paratypes. 140-197 fms.; Aug. 1, 1932; W. L. Schmitt; 3 males, 2 ovig. females. 153-158 fms.; July 22, 1931; W. L. Schmitt; 1 male, 1 ovig. female. 17 mi. south, 135-156 fms.; July 2, 1932; W. L. Schmitt; 1 ovig. female. 205-221 fms.; July 3, 1931; W. L. Schmitt; 1 juv. male from fish stomach.

Bahamas: 360 fms.; May 10, 1939; "Atlantis" sta. 3476, 1 dried male, MCZ 126694.

RANGE: Straits of Florida; 156-360 fms.;

DIAGNOSIS: Small species. Cornea swollen, antennal flagellum equaling pereopods. Armed only on carpus of major cheliped. Major chela moderately swollen.

DESCRIPTION: Carapace smooth, evenly rounded; anterior projections equal. Eyestalks short, cornea swollen. Eye scales narrowed, subapical spines strong. Terminal article of antennular peduncle begins at base of cornea. Antennal peduncle slightly exceeding eye, acicle subequal; flagellum nude, equaling pereopods.

Major cheliped sparsely setose. Merus with a spinule marking each distoventral angle. Carpus with ten or more spinules on inner dorsal angle. Margins of chelae feebly marked, inner margin a beaded line of granules. Minor cheliped equaling major. Carpus with dorsal margins of short spinules. Chela with median dorsal ridge of denticles extending to gape. Fingers long.

Carpus of walking legs with a distodorsal spinule or denticle. Dactyls slender, twisted, with stiff setae on distal margins. Propodal rasp of fourth pereopods a single row of scales. Telson long, bifid, with two recurved spinules bordered by denticles on each distal lobe.

COLOR: Holotype, in alcohol four years, still shows broad, light red bands on meri and propodi of walking legs, distally on merus of major chela and proximally on carpus.

MEASUREMENTS (mm.): Holotype male. Shield, length 4.0, width 4.1; carapace 6.6; eyes 3.0; major chela, length 8.2, width 3.2, dactyl 3.8; minor chela, length 6.9, width 1.7, dactyl 4.1; third right pereopod, basis-ischium 2.9, merus 5.4, carpus 3.4, propodus 5.5, dactyl 8.0.

Pagurus rubrolineatus n. sp.

MATERIAL EXAMINED: Male holotype; western edge of Rosalind Bank, Caribbean Sea; 16° 35' N., 80° 55' W.; 100 fms.; Sept. 24, 1957; "Oregon" sta. 1890; found in shell of

Phalium granulatum Born.

RANGE: Known only from the type.

DIAGNOSIS: Dorsal surfaces of carpus and propodus of chelipeds armed with a thick covering of short spines. Striking color pattern of red lines occurs on walking legs. Antennal flagellum slightly exceeds pereopods.

DESCRIPTION: Shield broader than long; frontal margin a thin raised line between sharp-spined lateral teeth; latter easily exceed blunt rostrum. Shallow grooves extend posteriorly from lateral teeth. Cardiac plate very narrow, poorly calcified; gill cover membranous.

Eyes shorter than shield, moderately swollen distally. A few stout setae rise from four punctae on inner dorsal surface of eyestalks and from a fifth on inner ventral surface. Eye scales typical of genus, with a minute subapical spine. Antennular peduncle exceeds eye by half of terminal segment. Base of antennal peduncle bears a lateral spinule, second segment with a spinule at inner angle, five ranging from minute to strong on inner surface of outer projection; terminal segment exceeds eye by one-half. Acicle strongly setose, exceeding eye by terminal spine. Flagellum with a few fine setae, exceeding pereopods.

Major cheliped bears four spines on anterodorsal margin, four more on inner ventral angle. Dorsal surface of carpus and chela armed with closely spaced spines on dorsal surfaces; with a row of nine stronger spines on inner dorsal margin of

carpus, a row of 20 on outer edge of propodus. Cutting edges of fingers composed of irregular, calcareous teeth; largest tooth on pollex located about three-fourths of distance from apex of gape. Dactyl has a few corneous scales between last calcareous tooth and corneous tip. Outer ventral surface of chela denticulate, denticles largest near margin; inner surface presents a few crested ridges of varying length.

Distodorsal angle of merus of minor cheliped armed with three sharp spines; outer ventral margin with eight spines, remainder with denticles. Dorsal surface of carpus with several strong spines, that of propodus with numerous spines on outer dorsal surface, denticles on inner surface. Fingers with cutting edges on distal half; teeth corneous on dactyl, evenly spaced and calcareous with intervening corneous scales on pollex.

Walking legs equal major cheliped; merus of first armed with two distodorsal spines, that of second with one spine. Dactyls of both legs present ventral and dorsal rows of corneous spinules which are stronger and more numerous near long corneous claws. Propodus of fourth pereopods with usual strong row of corneous scales on ventral margin; dactyl with a rasp of minute scales, and a denticle flanking base of long, straight claw. Chelate fifth pereopods with a rasp on distal half of propodus. Unpaired pleopods with a thumblike external ramus. Distal plates of telson

asymmetric, right larger; both triangular and armed with ten fine spinules on inner edges.

COLOR: Shield specked with red. Meri of first three pereopods with a transverse band of red bordering anterior margins laterally except at dorsal angle, where it forms a V. Walking legs with narrow red line running from outer, ventral terminus on merus of each leg almost to tip of dactyl. Another line appears halfway between first line and dorsal crest on carpus and continues along dorsal crests of propodus and dactyl on each leg. Some fine red specking appears on chelipeds.

MEASUREMENTS (mm.): Shield, length 8.2, width 8.7; carapace 13.5; eyes 6.1; major chela, length 16.5; width 9.3; dactyl 8.0; minor chela, length 11.8, width 4.7, dactyl 7.0; third leg, basis-ischium 6.0, merus 8.2, carpus 7.3, propodus 8.5, dactyl 12.0.

Pagurus schmitti n. sp.

MATERIAL EXAMINED: Twenty-one specimens from sixteen stations.

Holotype female; south of Tortugas, 79-140 fms.; July 2, 1932; W. L. Schmitt. Allotype female; Key West, Fla.; 110 fms.; J. B. Henderson.

All additional specimens are designated as paratypes.

Georgia: Between 34° 41'-33° 31' N. and 75° 31'-76° 35' W.; 180-230 fms.; June 14-16, 1957; "Combat" stas. 356-

369; 1 male.

Florida: 24° 22' N., 81° 58' W.; 98 fms.; Feb. 14, 1902; "Fish Hawk" sta. 7279; 3 females (2 ovig., 1 juv.), 1 male. 16 mi. south of Tortugas; 65-125 fms.; W. L. Schmitt; 1 male in Phalium shell. Off Garden Key, Tortugas; May, 1941; J. R. Miller; 1 female.

The following specimens from the Bahamas and Cuba were taken by the "Atlantis".

Bahamas: 26° 08' N., 79° 02' W.; 155 fms.; Feb. 3, 1938; sta. 2951; 1 ovig. female.

Cuba: 22° 47' N., 78° 49' W.; 210 fms.; Mar. 10, 1938; sta. 2981-B; 1 male. 22° 47' N., 78° 49' W.; 195 fms.; Mar. 10, 1938; sta. 2981-C; 1 ovig. female. 22° 48' N., 78° 50' W.; 210 fms.; Mar. 11, 1938; sta. 2982-A; 1 male (carapace length 25 mm.), 1 ovig. female. 22° 47' N., 78° 48' W.; 205-230 fms.; Mar. 11, 1938; sta. 2982-B; 1 male, 1 ovig. female. 22° 38' N., 78° 25' W.; 235 fms.; Apr. 28, 1939; sta. 3405, 1 male. 22° 42' N., 78° 39' W.; 200 fms.; Apr. 29, 1939; sta. 3407; 1 male.

Guianas: 09° 41' N., 59° 47' W.; 150 fms.; Nov. 3, 1957; "Oregon" sta. 1985; 1 male, 1 female. 07° 26' N., 54° 49' W.; Sept. 8, 1958; 1 female from Murex shell. 07° 27' N., 54° 27' W.; 120-135 fms.; Sept. 9, 1958, 1 ovig. female.

RANGE: Georgia to Surinam; 85 to 235 fms.

DIAGNOSIS: Faces of chelae armed with irregular rows of short spines. Dactyl of minor chela unusually long, hinged

near base of propodus; two rows of granules on dorsal surface.

DESCRIPTION: Shield smooth, with stiff setae near frontal margin and posterior to lateral teeth at two points on each side of gastric area. Rostrum and lateral teeth each tipped with a sharp spinule. Posterolateral plates narrowed at each end. Cardiac plate a narrow strip with adjacent calcified areas. Gill covers transparent.

Eyes $1\frac{1}{2}$ times as broad at cornea as at base; cornea large, black. Eye scales typical of genus, slightly concave dorsally and with a subapical spinule. Terminal segment of antennular peduncle begins at midlevel of cornea. A sharp, curved spinule located posterolateral to base of each antennal peduncle. Second segment with a sharp spinule at inner angle, outer projection triangular, spine-tipped. Terminal segment exceeds eye by at least a third. Acicle slightly exceeds eye: long setae in dorsal edge, spine at tip. Flagellum exceeds pereopods; minute setae appear at each articulation, a few long setae at considerable intervals.

Major cheliped with six stout spines on anterodorsal edge of merus. Surface of carpus covered with transverse, scale-like rows of short setae; inner dorsal margin armed with 14 spines, three more on distal edge. Marginal setae long. Propodal surface protected by numerous stout spines. Pollex with an outer, marginal row of corneous-tipped spines; dactyl with a dorsal and a dorsolateral row of similar, blunt

spines. Proximal two-thirds of cutting edges of fingers composed of long, blunt, calcareous teeth, fingers meeting only on distal half contacting edges beginning with a large calcareous tooth on pollex and an equal, more distal one on dactyl. Intervening space to tips set with rounded, calcareous teeth on pollex; minute, corneous denticles on dactyl. Surface of chela between spines covered with short setae.

Minor cheliped about half as strong as major, reaching to halfway point on dactyl of larger member. Merus with two small, anterodorsal spines; ventral margins unevenly armed with strong denticles. Dorsal surface of carpus bears four spines in row behind broad notch in anterior margin, with two smaller spines on each side of notch. Propodal surface covered with spines and short setae. Dactyl unusually long, articulating with propodus well behind gape proper; surface marked only by two low, beaded ridges. Outer margin with a fringe of long setae. Cutting edges meet only on distal half. Cutting edge of dactyl composed of corneous scales entirely; that of pollex consists of calcareous teeth more widely spaced distally, with corneous scales filling the spaces. Tips of fingers amber-colored, corneous; round tip of dactyl closing under flat tip of pollex. Fringe of long setae borders outer edge of chela.

Walking legs equal major cheliped. Dorsal crest of carpus of first armed on forepart with five spines; that of second walking leg with four smaller, more distal spines.

Numerous strong setae on dorsal surfaces of both walking legs, increasing in size and number distally. Dactyl with a shallow, longitudinal groove on each side; tips long, corneous.

Propodus of fourth pereopods with a uniseriate rasp of about 20 broad scales on distal two-thirds of ventral margin; rasp of stout dactyl composed of minute scales. Propodus of fifth pereopods covered by a rasp on distal half of outer surface. A pair of anterior pleopods present on female; latter carries at least 5,000 eggs, each 0.5 mm. in diameter. Male pleopods small, external ramus a minute, translucent projection. Telson quite symmetrical, terminal lobes produced at outer edge; distal median cleft a broad V armed with a solid row of short, calcareous teeth.

COLOR: Specimens from "Oregon" sta. 1985 after six months in alcohol. A general hue of apricot on the following parts: Eyestalks, merus of chelipeds laterally and in a broad transverse band above and along distal margin, carpus and chela of chelipeds, and on walking legs except for a white band behind anterior margins of merus.

MEASUREMENTS (mm.): Holotype female. Shield, length 7.7, width 7.5; carapace 13.5; eyes 5.8; major chela, length 15.4, width 8.2; dactyl 8.0; minor chela, length 12.5, width 5.4, dactyl 9.5; third right pereopod, basis-ischium 6.5, merus 9.6, carpus 7.3, propodus 9.0, dactyl 14.5.

REMARKS: While the presence of an anterior pair of

pleopods in all females from the northern part of the range would call for placement of this species in a different genus, the absence of paired pleopods in females from Guiana makes the actual status of the species doubtful. In the absence of other differences the specimens from the two areas are here considered to belong to the same species. Since the evolutionary tendency seems to be a reduction of parts, the most logical solution seems to be to place the species in the genus Pagurus.

Pagurus stimpsoni (Milne Edwards and Bouvier)

Eupagurus stimpsoni Milne Edwards and Bouvier, 1893,
p. 146, figs. 19-25.

Pagurus stimpsoni Gordan, 1956, p. 335.

MATERIAL EXAMINED: Off Panama City, Fla.; 15 fms.;
July, 1958; Neil C. Hulings; 1 male, 1 ovig. female.

RANGE: Off Panama City, Florida.

DIAGNOSIS: Corneas very little dilated. Major cheliped armed with two rows of strong spines on inner border of carpus, five spines on inner margin of hand. Dactyls of walking legs slender.

DESCRIPTION: Shield smooth on gastric region; anterior projections little marked. Eyes subequal to shield, little swollen at cornea; minute setae stem from three spots on inner dorsal part of stalk. Eye scales broadly oval, with a

small terminal spinule. Antennular peduncle exceeding eyes by half of terminal segment; that of antennae little longer than eyes. Flagellum equaling pereopods, nude; articles moderately long.

Major cheliped exceeding minor, well armed on inner dorsal margin. Merus armed on distoventral angles with strong spinules, two on outer angle and one on inner; a single distodorsal spinule. Carpus with 15 spines in two rows on inner dorsal angle. Chela armed with five strong spines on inner dorsal margin of palm; outer margin marked by a line of fine teeth. Dorsal surface otherwise smooth, sparsely setose. Fingers present two strong teeth on dactyl, one on pollex fitting behind first on dactyl.

Minor cheliped narrow; carpus armed with several spines in two dorsal rows. Outer dorsal angle of chela with seven spinules; fingers long. Walking legs slender, unarmed, sparsely setose. Dactyl more slender than propodus, with a few corneous spinules ventrally; claw long, fine. Propodal rasp of fourth pereopod with three rows of scales. Telson with angular distal lobes terminated by a recurved spinule; finely toothed on median margins.

COLOR: After eight months in alcohol, faint red markings persist in the following places: A broad band on carpus of chelipeds; inner surface of palm of major chela; a fine, longitudinal line on face of dactyl. Walking legs with two narrow stripes on outside of merus, carpus, and

propodus. Faint patches of color connect these lines in the center of each segment.

MEASUREMENTS (mm.): Male from Panama City. Shield, length 2.0, width 2.0; carapace 3.2; eyes 1.7; major chela, length 4.3, width 2.1, dactyl 2.0; third right pereopod, basis-ischium 1.0, merus 2.2, carpus 1.8, propodus 2.6, dactyl 3.7.

REMARKS: The holotype male could not be located at the MCZ. This species is quite variable in the armament of the chelipeds. It is closest to Pagurus brevidactylus Stimpson but can be separated from that species by the row of strong spines on the inner dorsal surface of the right palm.

Pagurus tenuidactylus n. sp.

MATERIAL EXAMINED: Holotype male, MCZ 126686, 22° 34' N., 78° 16' W.; 180 fms.; Apr. 28, 1939; "Atlantis" sta. 3397.

RANGE: Known only from type locality, off Cayo Coco, Cuba.

DIAGNOSIS: Carapace and head appendages largely typical of the genus. Terminal segment of antennular peduncle slightly exceeds shield length. Antennal flagellum reaching approximately 14 mm. beyond tips of legs. Chelipeds armed with spines on inner dorsal margin. Dactyls of walking legs very slender.

DESCRIPTION: Shield heart-shaped laterally, smooth and flat on median surface; gastric region outlined by minute tufts of setae. Frontal margin uniformly raised between lateral teeth; latter marked by denticles and exceeding evenly rounded rostrum. Cardiac plate translucent, broadened posteriorly; gill covers membranous.

Eyes little shorter than shield, slightly swollen proximally, greatly so distally. Eye scales slightly concave above, with a terminal spine. Antennular peduncle exceeds eyes by terminal segment. Second segment of antennal peduncle bears a spinule on inner angle, a stronger spine on outer angle; third segment with a spinule on inner angle; terminal segment exceeding eye by one half. Acicle slightly exceeds cornea.

Major cheliped with sharp denticles on lower margin of ischium and merus, a spine at each anteroventral angle of merus and two more on anterodorsal angle. Carpus with six spines on inner dorsal margin, several scattered spinules toward outer side. A carpal spine protects outer articulating socket. Inner dorsal margin of propodus presents 15 short, curved spines; upper surface evenly rounded, with short, sparse setae. Outer margin indicated by slightly raised line. Dactyl has a few spinules on median margin. Fingers meet almost completely but without meshing closely, tip of dactyl passes beneath tip of pollex. Both finger and thumb present about six low, calcareous teeth on cutting edges.

Minor cheliped has ischium and merus armed much as in the major member; carpus bears seven spines along inner margin, several spinules near outer margin. A few minute spinules appear on outer edge of palm. Dactyl bears a row of stiff setae on median dorsal surface. Setose pubescence occurs on most surfaces. Fingers close throughout; cutting edges of fine, corneous teeth, with those on pollex reinforced by small, calcareous teeth at varying intervals.

Second pereopods present six small spines on dorsal margin of carpus, the strongest placed anteriorly. Carpus of third pereopods with one or two anterodorsal spines. Propodus of both walking legs with corneous spinules on distal margin of lower median surface. Dactyls bear two rows of coarse setae directed medially from upper and lower surfaces. Short corneous tips of dactyls undifferentiated in color and shape.

Propodus of fourth pereopods with a single row of 15 prominent scales on distal four-fifths of ventral margin. Dactyl slightly shorter than propodus, with very fine scales on distal half of ventral surface. Subchelate propodus of fifth pereopods with a distal rasp on less than half of outer surface. Sternal plate separating third maxillipeds broad, unarmed. Telson widely bifid; each lateral plate armed distally with four curved spines.

MEASUREMENTS (mm.): Shield, length 3.4, width 3.8; carapace length 5.6; eyes 2.8; major chela, length 7.0,

width 3.6, fingers 3.3; third leg, basis-ischium 2.5, merus 4.0, carpus 2.5, propodus 5.2, dactyl 6.3.

Genus Parapagurus Smith

Parapagurus pilosimanus Smith

Parapagurus pilosimanus Smith, 1879, p. 51. --Gordan, 1956, p. 338. --Springer and Bullis, 1956, p. 16.

Eupagurus jacobii A. Milne Edwards, 1880.

Pagurus pilosimanus Williamson, 1915.

Pagurus jacobii Gordan, 1956, p. 331.

MATERIAL EXAMINED: Three specimens from two stations.

Florida: 24° 35' N., 79° 58' W.; 565 fms.; July 25, 1957; "Combat" sta. 452; 2 males.

Nicaragua: 12° 25' N., 82° 23' W.; 400-425 fms.; Sept. 11, 1957; "Oregon" sta. 1907; 1 male.

RANGE: Found in most of the major oceans and seas; 250 to 640 fms.

DIAGNOSIS: Eyes reduced, about half as long as shield. Antennal flagellum nude, half again as long as walking legs. Chelipeds covered with short, pilose hair. Walking legs exceeding major cheliped. Abdomen reduced, usually housed in an anemone.

DESCRIPTION: Shield wider than long, broadest at middle. Margin of front angled back from blunt rostrum. Cardiac plate narrowed posteriorly, shorter than shield.

Eyes exceeded by last two segments of antennular peduncle. Eye stalks with a dorsal row of dense hair. Eye scales spiniform, feeble.

Major chela much stronger than minor. Walking legs slender, long, nude except for short, stiff setae on dactyl; setae form a solid row near tip of dactyl.

COLOR: Specimen in formalin four months. Body and appendages cream, dactyls of walking legs buff with scarlet setae.

MEASUREMENTS (mm.): Shield, length 11.5, width 12.5; carapace 18; eyes 5.2; right chela, length 22, width 10, dactyl 11.5; left chela, length 12.5, width 5, dactyl 7.5; third right pereopod, basis-ischium 9.5, merus 18.5, carpus 10.5, propodus 20.5, dactyl 30.

Genus Pylonaguropsis Alcock

Pylonaguropsis atlantica n. sp.

MATERIAL EXAMINED: Holotype male, allotype female (ovig.); paratypes, 21 males and 18 females (9 ovig. or recently so); 07° 25' N., 54° 35' W.; 75-80 fms.; Sept. 8, 1958; "Oregon" sta. 2289.

RANGE: Type locality, off Surinam.

DIAGNOSIS: Right chela massive, much larger than left. Female with a pair of appendages on first segment of abdomen, four unpaired pleopods following; male with only three un-

paired pleopods. Gill pairs 13; filaments narrow.

DESCRIPTION: Shield well calcified, smooth; rostrum exceeding lateral teeth. Cardiac plate broad, membranous. Eyes moderate, slightly swollen at bases and cornea. Eye scales long, triangular, sharp-tipped. Antennular peduncle exceeding eyes by less than half of terminal segment, antennal peduncle shorter, acicle equaling eyes. Flagellum strong, exceeding pereopods; feebly setose.

Major cheliped heavy, as long as body, almost nude. Merus with high dorsal ridge, spines and denticles on inner ventral angle. Carpus with two rows of denticles on dorsal ridge; outer margin shelf-like. Propodus subchelate, articulating obliquely with carpus; thus heavy dactyl opens somewhat obliquely but not vertically. Dorsal surface granular to denticulate; outer margin heavy, produced. Cutting edges with a broad median tooth on pollex fitting a gap between two smaller teeth on dactyl. Teeth corneous near tip of dactyl. Under side of chela appears hollowed out in midsection and inside outer margin.

Minor cheliped feeble, not reaching dactyl of major. A few spinules on outer distoventral margin of merus; dorsal ridge of stronger spines on carpus. Fingers long, bent downward. Walking legs slender, sparsely setose dorsally. Merus with several short spinules on dorsal angles. Propodus and dactyl more or less grooved on outer sides. Dactyl presents many flexible spinules on inner surfaces.

Propodal rasp about four scales wide on fourth pereopods; fifth with rasp on distal two-thirds. Broad sternal plate between third maxillipeds with median suture flanked by a minute denticle on each side. Paired anterior pleopods of female feeble. Female with most eggs carries about 350, each about 0.6 mm. in diameter. Male pleopods biramous, a patch of setae near base of second. Narrow calcareous margin of telson finely serrate along shallow distal cleft.

COLOR: Shield generally rose with light stripes behind rostrum and lateral teeth. Eye scales outlined with scarlet anteriorly. Antennal flagella with a scarlet line on each side. Pereiopods peach red dorsally to pink ventrally, liberally specked with red. First of posterior abdominal plates rose colored.

MEASUREMENTS (mm.): Male holotype; shield, length 7.8, width 7.6; carapace 13.5; eyes 6.4; right chela, length 19.5, width 11.7, dactyl 10.6; left chela, length 10.5, width 3.2, dactyl 6.8; third right pereopod, basis-ischium 3.2, merus 9.3, carpus 6.4, propodus 8.4, dactyl 14.5.

Genus Pyloragurus Milne Edwards and Bouvier

Shield rounded, glabrous; rostrum obsolescent. Eyes shorter than shield, dilated at cornea. Eye scales as in Pagurus, usually rather narrow triangular; subapical spine always present. Peduncles of antennules and antennae exceeding eyes; feebly armed. Antennal flagellum usually subequal

to pereopods, nude or with a few longer setae.

Right cheliped much stronger than left; chela broad and usually covered with tubercles, forming an operculum with aid of small, elongate left chela or by itself. Tubercles mushroom-shaped and usually adjoining. Walking legs strong, sparsely setose. Fourth pereopods with a propodal rasp usually consisting of about four rows of scales, uniseriate in a few species.

Outer maxillipeds with a spine on ischium lateral to serrate inner margin. Sternum separating these maxillipeds usually bidentate at midline. Sternum separating coxae of third pereopods often supporting a projection, this and following sterna frequently with peculiar swollen hairs.

Female gonopods feeble. Telson deeply cleft at midline.

Gill pairs 11; similar to those of Pagurus.

The members of this genus are usually small forms.

Most of the species are found at the edge of the shelf. The genus is predominantly new world; 15 species are herein listed from the Atlantic side and probably as many occur in the Pacific. Two are known from southern Africa. The Pylonagurus exquisetus of Boone (1927) is referable to Sympagurus arcuatus A. Milne Edwards and Bouvier.

Pylonagurus

1. Major chela not carried at an angle with carpus.....2.

- Major chela carried at right angle to carpus.....4.
2. Tubercles on face of major chela.....chacei.
Face of major chela lacking tubercles.....andersoni.
3. Propodal rasp of fourth pereopods uniseriate.....4.
Rasp composed of at least 3 rows of fine scales.....5.
4. Face of chela smooth, lacking tubercles.....discoidalis.
Face of chela with mushroom-like tubercles.....rosaceus.
5. Tubercles on face of chela small, tipped with a sharp spinule.....6.
Tubercles larger, not tipped with sharp spines.....8.
6. A sharp spine rising from narrow space between third pair of coxae.....corallinus.
Third pair of coxae more widely spaced; intercoxal projection not spinous.....guianensis.
7. A high, rounded boss in center of face of major chela, deep depressions on each side.....hispidus.
Face not as irregularly sculptured.....8.
8. Face of major chela long, very concave.....cavimanus.
Center of face as high or higher than margins.....9.
9. Tubercles separated, not interlocking to cover surface proper.....10.
Tubercles closely spaced, usually interlocking.....11.
10. Tubercles large, widely spaced; with very irregular margins.....erosus.
Tubercles more closely spaced; with minutely serrate borders.....boletifer.
11. Tubercles of major chela with a projecting denticle above.....bartletti.
Tubercles lacking a dorsal denticle.....12.
12. Major chela lacking margins.....zibbosimanus.

- Major chela with margins of denticles or spines.....13.
13. Teeth in outer margin strong, irregular.....alexandri.
Marginal teeth rather evenly serrate.....14.
14. Blunt spines at proximal end of median dorsal ridge of palm, strong ridge on dactyl of chela, tiny species.....hendersoni.
Dorsal surface of chela relatively smooth, medium-sized species.....serratus.

Pylopagurus andersoni n. sp.

MATERIAL EXAMINED: Twenty-six specimens from four general areas.

Holotype male, allotype female (ovig.), 4 males and 2 female paratypes; off Cape San Blas, Fla.; 29° 28' N., 85° 31' W.; 12 fms.; Feb. 1, 1956; "A. A. Jakkula".

All of the following specimens are designated as paratypes.

Off North Carolina: 35° 08' N., 75° 10' W.; 49 fms.; Oct. 17, 1885; "Albatross" sta. 2956; 2 males. 34° 38' N., 76° 12' W.; 18 fms.; Oct. 19, 1885; "Albatross" sta. 2607; 2 ovig. females. 34° 37' N., 75° 40' W.; 34 fms.; Oct. 18, 1885; "Albatross" sta. 2604; 2 ovig. females.

Off South Carolina: 32° 51' N., 78° 59' W.; 14 fms.; Mar. 4, 1939; "Pelican" sta. 182-23; 1 in shell. 30° 34' N., 79° 05' W.; 19 fms.; Mar. 9, 1940; "Pelican" sta. 194-10; 1 male.

Off Western Florida: 30° 12' N., 86° 01' W.; 12 fms.;

Mar. 4, 1939; "Pelican" stas. 141-4; 1 ovig. female. $29^{\circ} 11' N.$, $85^{\circ} 29' W.$; 26 fms.; "Albatross" sta. 2374; 1 male. $28^{\circ} 46' N.$, $84^{\circ} 49' W.$; 26 fms.; Mar. 15, 1885; "Albatross" sta. 2406; 1 male and 1 female. $28^{\circ} 45' N.$, $85^{\circ} 02' W.$; 30 fms.; Mar. 15, 1885; "Albatross" sta. 2405; 1 male in shell of Turbo castaneus. "Opposite Anclote River"; Nov.-Dec., 1900; J. E. Benedict; 1 female in sponge-covered shell, 1 in a long, conical shell.

Off Southern Florida: $25^{\circ} 04' N.$, $82^{\circ} 59' W.$; 24 fms.; Mar. 19, 1885; "Albatross" sta. 2413; 1 ovig. female. South of Loggerhead Key, Tortugas; June 19, 1925; W. R. Taylor; 1 male. Off Miami; 30 fms.; May, 1912; J. B. Henderson; 1 male, "sponge dark maroon, crab red".

RANGE: North Carolina to northwestern Florida; 12-49 fms.

DIAGNOSIS: Walking legs longitudinally striped. Major cheliped heavy; dorsal surface of chela with numerous denticles, latter largest distally. Denticulate margins of right chela forming a serrate edge.

DESCRIPTION: Carapace glabrous, shield equaling cardiac plate. Rostrum blunt, reaching base of eye scales, scarcely exceeding lateral teeth. Eyes shorter than shield, curved outward, cornea moderately swollen. Eye scales narrow triangular, with raised margins. Antennular peduncle exceeding eyes by half of terminal segment. Antennal peduncle slightly exceeding eyes; second segment with a minute

spinule on inner angle, outer projection ending in a spinule. Acicle sparsely setose, reaching midway on cornea. Flagellum finely bristled at each article, equaling pereopods.

Right cheliped broad, massive, obscuring narrow left member. Merus with a small spinule on outer distal margin. Carpus armed on elevated lateral margins; on inner margin with a few small denticles behind a stout denticle above hinge. A strong denticle on inner margin below hinge, followed by numerous granules proximally. Distodorsal margin straight, with a few small denticles immediately posterior. Chela little longer than wide, tending toward subchelate. Pollex triangular; fingers with blunt, calcareous tips. Propodal margins finely crenulate on outer margin, irregular on inner; face with conical denticles much larger distally. Dactyl with a marginal row of denticles forming a serrate line; a dorsal ridge of low, scale-like denticles. Entire cutting edge of dactyl closes under that of pollex. A fleshy fold protrudes ventrally between carpus and propodus.

Minor cheliped narrow, feeble. Carpus equaling chela, dorsal surface with a low, inner ridge bearing three spinules and terminating in a distal spine, outer margin with only a distal spine. Ventrodistal, outer angles of both merus and carpus bear a spinule. Dorsal ridge of propodus leads to a spinule at base of cutting edges; latter with only fine, corneous edges. Fingers spooned, with many tufts of fine setae on ventral and outer distal parts of fingers.

Walking legs most compressed in proximal and distal segments. Distodorsal angles of carpus armed with a spinule. Dactyl with margins bearing strong setae above, spinulose setae below; claws sharp. Rasp of fourth pereopods a ventral row of scales, of fifth a quadrate patch on outer distal half of propodus.

Rounded boss appears between third pair of coxae, wide thin plate between fourth pair. Female gonopods small, little separated. Eggs on allotype number about 200, each .5 mm. in diameter. Male pleopods fairly long, outer ramus a fourth as long as inner. Telson with a shallow median cleft; armed with calcareous spinules.

COLOR: (Specimens from Cape San Blas after 2½ years in alcohol) Shield salmon with white near anterior margin and on irregular grooves running back from lateral teeth; a triangular red dot near posterior end of each white line. Front and edges of eye scales with fine red margins. Transparent, diamond-shaped area covers cardiac region, with a red spot at each lateral angle. Eyestalks uniformly apricot, corneas black.

Merus of major chela with a white dorsal angle bordered by salmon. Carpus cream colored above, with marginal ridges white; distodorsal margin with a fine red line. Surface of chela similar to carpus, with denticles lighter; margins marked by pattern of alternating red and white. Red sub-marginal bands occur on inner surfaces of carpus and chela.

Four distal segments of legs with burnt orange longitudinal stripes tending to be broadest at midpoint of segments. Dactyl with same color in lateral grooves and as irregular blotches on remaining surface.

MEASUREMENTS (mm.): Male holotype: Shield, length 3.5, width 3.6; carapace 6.6; eyes 3.2; major chela, length 8.2, width 6.0, dactyl 4.2; minor chela, length 3.8, width 1.4, dactyl 2.3, third leg, basis-ischium 2.7, merus 3.8, carpus 2.5, propodus 4.0, dactyl 5.7.

REMARKS: This species bears a close resemblance to Pagurus oerculatus (Stimpson) although the color pattern in fresh material is quite different. However, Provenzano (in litt.) reports that the only female ever collected of the latter species lacks an anterior pair of pleopods characteristic of the genus Pylonagurus. Both species usually exhibit a characteristic fleshy fold ventrally at the articulation of the carpus and propodus in the major chela.

This species is named for Mr. William W. Anderson who collected many specimens while in charge of the "Pelican".

Pylonagurus bartletti (A. Milne Edwards)

Eupagurus bartletti A. Milne Edwards, 1880, p. 41.

Pylonagurus bartletti Milne Edwards and Bouvier, 1893, p. 91, pl. 7, figs. 1-9. --Springer and Bullis, 1956, p. 16. --Gordan, 1956, p. 340.

MATERIAL EXAMINED: Eight specimens from five stations.

Male type; St. Vincent, 146 fms., "Blake" sta. 223.

Gulf of Mexico: 27° 08' N., 84° 53' W.; 150-175 fms.; April 3, 1954; "Oregon" sta. 954; 1 male, USNM 97467. 25° 08' N., 84° 19' W.; 163 fms.; Apr. 19, 1954; "Oregon" sta. 1026; 1 female, USNM 97468.

Off mouth of Orinoco River: 09° 45' N., 59° 45' W.; Nov. 4, 1957; "Oregon" sta. 1989; 2 males, 2 females (1 ovig.).

Off mouth of Amazon River: 02° 04' N., 47° 00' W., 125 fms.; Nov. 17, 1957; "Oregon" sta. 2080; 1 male, USNM 101663.

RANGE: Western Gulf of Mexico to mouth of Amazon River; 82 to 209 fms.

DIAGNOSIS: Exposed faces of chelae bear hat-shaped projections which overlap and interlock; each projection has a many-toothed, uneven margin and a strong, rounded tooth above. Outer half of minor chela contributes to operculum. One of larger species in genus.

DESCRIPTION: Shield rounded, as broad as long. Frontal margin narrow, raised. Rostrum obtuse, equaling lateral teeth. Cardiac plate narrow, lightly calcified. Eyes short, greatly swollen at cornea; four tufts of thin setae on dorsal surface. Eye scale triangular, margins raised, apical spinule present. Antennular peduncle exceeding eye by terminal segment. Antennal peduncle exceeding eye by two-thirds of terminal segment; second segment with a denticle on inner angle, small spinules on short outer projection. Acicle easily exceeding eye.

Chelipeds with plentiful setae, a few marginal spinules on dorsal surfaces of carpus. Marginal projections of chelae strong, broad; usually with two stout spines, or one flanked by denticles. A broad, median longitudinal ridge extends full length of major manus; flanked by a shallow depression on either side. Dactyl presents a sharper dorsal ridge consisting of a row of projections. Minor chela similar to major; inner margin unarmed, setose. Dactyl smooth, save for a dorsal and a marginal row of setae.

Walking legs compressed; dorsal margins wavy, setose, unarmed. Dactyl with a line of corneous spinules on ventral margins. Propodus of fourth pereopods with a rasp about five scales wide; rasp of fifth covers most of outer, distal half of propodus. Thumb-shaped sternal projection fills space between third coxae. Males bear numerous swollen hairs, chitinous in appearance, between third, fourth, and fifth pairs of coxae. These hairs smaller and much less numerous on females. Female gonopods feeble, with a distal brush of long, fine hairs. Eggs large, about 1 mm. in diameter. Telson nearly symmetrical, feebly armed on inner margins of dorsal lobes.

COLOR: Specimens from "Oregon" sta. 1989 after one year in alcohol. Mushroom-like projections on chelae apricot with spines on marginal projections coral. Walking legs Indian orange, with broad bands and blotches of white obscuring much of the orange color.

MEASUREMENTS (mm.): Shield, length 7.0, width 7.0; carapace 11.7; eyes 5.3; major chela, length 14.5, width 9.0, dactyl 7.0; minor chela, length 10.8, width 4.0, dactyl 6.0; third pereopod, basis-ischium 5.3, merus 7.2, carpus 5.8, propodus 5.6, dactyl 9.4.

Pylonagurus cavimanus Chace

Pylonagurus cavimanus Chace, 1939, p. 48.

MATERIAL EXAMINED: Two specimens from Cuba.

Cuba: Holotype female, MCZ 10233; 22° 07' N., 81° 08' W.; 150-170 fms.; Feb. 25, 1939; "Atlantis" sta. 2963-B. 23° 09' N., 81° 26' W.; 230 fms.; May 9, 1939; "Atlantis" sta. 3463; 1 female.

RANGE: North and south of Cuba, 170 to 230 fms.

DIAGNOSIS: Face of major chela unusually concave except for slight central rise. Spinulose margins raised and almost perpendicular to plane of face. Surface covered by flat, mushroom-like tubercles.

DESCRIPTION: Shield glabrous, very convex laterally. Rostrum obtuse, exceeding lateral teeth but not ophthalmic somite. Cardiac plate short, narrowed anteriorly. Eyes strong, more swollen at cornea than basally; length not exceeding that of shield. Eye scales narrow, subapical spine unusually strong. Antennular peduncle equalling eyes; that of antenna not reaching cornea. Acicle styliform, setose on

inner margin. Flagellum very thin, exceeding pereopods, nude except for several long hairs.

Major cheliped with several spinules on outer ventral angle of merus; carpus armed with dorsolateral rows of spines and an irregular dorsal row medial to shallow, mid-dorsal trough. Face of chela narrow proximally, with two posteriorly directed spines at this point. Distally from here the margin turns up until it again flattens out at the fingertips. Surface tubercles rounded and flat from above; not continuous with spinous margins. Cutting edges of fingers composed of irregular, calcareous teeth. Corneous tips minute. Carpus of minor cheliped with several strong spines on dorsal surface of carpus. Chela with inner margin setose, outer armed with numerous spines of varying size. Straight cutting edges corneous on dactyl, with fine calcareous teeth on pollex.

Walking legs compressed, sparsely setose. Dactyls with stiff setae dorsally, short corneous setae ventrally. Propodus of fourth pereopods with rasp three scales wide; dactyl with comb-like, single row of scales. Propodus of fifth with rasp on distal two-thirds of outer surface. Sternum separating third maxillipeds has two median, minute spinules; that between fourth pereopods bears a single seta, while last sternal plate presents two such hairs. Female gonopods approximated. Terminal abdominal appendages sub-symmetrical. Telson unarmed.

MEASUREMENTS (mm.): Female from "Atlantis" sta. 3463.

Shield, length 7.8, width 5.5; carapace 11.4; eyes 6.3; right chela, length 13.4, width 7.2, dactyl 6.0; left chela, length 8.0, width 2.5, dactyl 4.0.

Pylodagurus chacei n. sp.

MATERIAL EXAMINED: Holotype male and paratype male; 07° 25' N., 54° 35' W.; 75-80 fms.; Sept. 8, 1958; "Oregon" sta. 2289.

RANGE: Type locality, off Surinam.

DIAGNOSIS: Major cheliped large, evenly flexed; tubercles on face of chela with four to eight sides, each with a short denticle directed forward. A large tooth on dorsal surface proximal to inner hinge joint.

DESCRIPTION: Shield smooth, three anterior projections equal. Eyes short, swollen distally; two tufts of bristles on dorsal surface of stalk. Retracted antennular peduncle reaches cornea. Antennal peduncle exceeding eyes, acicle equaling. Flagellum equaling pereopods; a few fine setae present.

Major cheliped heavy. Carpus covered with short, stiff setae above; outer dorsal margin feeble, inner armed with ten teeth. Surface of major chela covered with even, close-fitting tubercles, each with four to eight sides and a distally-directed dorsal papilla. Outer margin evident on pollex as well as palm; inner margin of palm consisting of a few evenly spaced

denticles. Tooth proximal to inner hinge joint much larger. Dactyl has a large denticle at beginning of marginal row of minute denticles. Cutting edges of fingers consist entirely of calcareous, crushing teeth.

Minor chela granular on dorsal angle and outer surface. Dactyl smooth, longer than usual. Cutting edges typical. Carpus of minor cheliped with a few spinules on dorsal angle. Walking legs quite smooth and almost nude. A minute disto-dorsal spinule on each merus; short, sparse setae on dorsal angles of all segments; spinulose setae on dactyls.

Propodal rasp uniseriate on fourth pereopods; rasp of fifth covering a little more than outer half of chela. Sternum separating third maxillipeds with a median tuft of fine setae but lacking spinules. Swollen hairs occur on rounded projection between third coxae, on long plate separating fourth coxae and at outer ends of plates between fifth coxae. All three pleopods biramous. Telson slightly asymmetric, minutely toothed on margins of median, distal notch.

COLOR: Bodies and head appendages blackened. (Specimens in formalin four months.) Chelipeds with peach red to orange vermillion blotches on a background of cream to salmon. Coloring of walking legs generally darker, in broad broken bands.

MEASUREMENTS (mm.): Shield, length 4.1, width 4.3; carapace 6.8; eyes 3.8; right chela, length 8.5, width 5.0, dactyl 4.3; left chela, length 6.0, width 2.3, dactyl 4.1;

third right pereopod, basis-ischium 3.0, merus 4.7, carpus 3.9, propodus 5.0, dactyl 7.9.

Pylonagurus corallinus (Benedict)

Eupagurus corallinus Benedict, 1892, p. 23.

Pylonagurus unguulatus Milne Edwards and Bouvier, 1893, p. 90, pl. 6, fig. 15-18. Not Pylonagurus unguulatus Studer, 1883, p. 26, pl. 2, fig. 13 a-c.

Pagurus corallinus Hay and Shore, 1918, p. 412, pl. 30, fig. 4. --Gordan, 1956, p. 328.

Pylonagurus corallinus Springer and Bullis, 1956, p. 16.

MATERIAL EXAMINED: Nineteen specimens from 12 stations.

Off South Carolina: 32° 34' N., 79° 05' W.; 19 fms.; May 9, 1940; "Pelican" sta. 194-10; 4 males, 1 ovig. female.

Off Georgia: "Umbrella Creek, Ga., W. W. Anderson," 1 male, 2 females.

Off eastern Florida: 30° 28' N., 80° 48' W.; 15 fms.; Jan. 25, 1940; "Pelican" sta. 176-7; 1 male. 28° 09' N., 80° 12' W.; 18 fms.; Jan. 17, 1940; "Pelican" sta. 168-3, 1 in a bryozoan colony.

Off Texas: 28° 46' N., 93° 25' W.; 15 fms.; July 12, 1938; "Pelican" sta. 100-3; 1 in bryozoan.

Off Western Florida: 30° 13' N., 86° 10' W.; 15 fms.; Mar. 9, 1939; "Pelican" sta. 151-2; 2 ovig. females. Off Cape San Blas; 29° 28' N., 85° 31' W.; 12 fms.; Feb. 1, 1956; "A. A. Jakkula"; 1 male, 1 ovig. female.

28° 09' N., 80° 12' W., 18 fms., Jan. 17, 1940; "Oregon" sta. 730; 1 male in bryozoan. "West Florida", 19 fms., "Bache," Wm. Stimpson, 1 female (MCZ specimen labeled Pyloragurus unguatus by A. Milne Edwards).

South Florida: Tortugas; 25 fms., 1924; W. L. Schmitt; 1 male. 25° 04' N., 82° 59' W.; 26 fms., Mar. 19, 1885; "Albatross" sta. 2414; 1 in bryozoan. Off Key West; 60 fms., June 19, 1893; State U. of Iowa Exped., 1 ovig. female.

The USNM has 60 other specimens, mainly from "Albatross" stations, taken along the Gulf coast, at depths up to 56 fms., from the delta of the Mississippi to the Straits of Florida and off Cabo Catoche, Yucatan.

RANGE: Beaufort, N.C., to the northern and eastern Gulf of Mexico south to Campeche Bank; 15 to 60 fms.

DIAGNOSIS: Major chela resembling that of P. discoidalis in general shape. Surface covered with tubercles, each of which bears a spinule. Spinules directed upward on proximal part of chela, forward on distal part. Margin of strong, upward-pointing spines surrounds entire face of chela. Strong spine projects from sternum between coxae of third pereopods.

DESCRIPTION: Shield smooth, rounded laterally. Blunt, triangular rostrum exceeding lateral teeth. Eyes shorter than shield, swollen at cornea. Eye scale triangular distally, with strong subapical spinule. Antennular peduncle exceeding eyes by terminal segment. Antennal peduncle exceeding eyes by two-thirds of terminal segment; second segment with

a spinule at inner angle and at tip of short outer projection. Acicle slender, subequal to cornea.

Major cheliped with small, spinous projections on dorsal surfaces of both carpus and propodus. Carpus with spinous denticles on outer distal and inner margins. Chela oval proximally, more pointed distally, fringed with close-set spines. Face covered with small, spinous projections; row with stronger spines extends from proximal margin to base of cutting edges. Minor chela small, face rather flat and granular; margins beaded. Fingers spooned; cutting edges corneous, with a slight proximal gape.

Walking legs compressed, with a few distal spinules on dorsal angles of carpus. Propodus and dactyl bear sparse, short setae; those on dactyls directed more or less inward and forward. Rasp on propodus of fourth pereopods small, placed distally; dactyl short, stout. Propodus of fifth with rasp on distal outer half including surface of weak dactyl. Narrow spine projects from sternum closely spaced third coxae. Ovigerous female from off Cape San Blas (carapace length 4 mm.) carries over 600 eggs, each 0.4 mm. in diameter.

COLOR: Specimens from "Oregon" sta. 730 after seven years in alcohol. Scarlet blotches and vermiculations appear on merus of major cheliped and in two broad bands on carpus. Proximal part of face of chela suffused with rose; finely spinulose border scarlet. Walking legs with scarlet

on most of merus, in two bands on carpus, one broad band on propodus and a narrow band on dactyl.

MEASUREMENTS (mm.): Specimen from "Oregon" sta. 730. Shield, length 4.5, width 4.2; carapace 8.5; eyes 3.5; right chela, length 10.7, width 6.0, dactyl 6.5; left chela, length 7.0, width 3.0, dactyl 4.6; third right pereopod, basis-ischium 3.5, merus 5.6, carpus 4.3, propodus 6.5, dactyl 8.0.

REMARKS: P. corallinus is closely related to P. cervicornis and P. varians of the Gulf of California and to P. guianensis from northeastern South America. It differs from cervicornis in having the tubercles on the face of the hand more even in size and greater in number. P. varians has the spinulose tips of the tubercles directed forward instead of at right angles to the face.

More striking differences occur in the structure of the sternal spine projecting from between the third pair of coxae. In corallinus the spine is narrow and sharp and the coxae are very closely spaced. P. cervicornis and P. guianensis have the coxae more widely separated and the spine heavier, more blunt and setose at the tip. P. varians also has the coxae more widely set and a spine with numerous denticles around the tip as in a mace.

All of these species usually live in bryozoan colonies.

Pylosagurus discoidalis (A. Milne Edwards)

Eupagurus discoidalis A. Milne Edwards, 1880, p. 41.

Pylosagurus discoidalis Milne Edwards and Bouvier, 1893, p. 76, pl. 6, figs. 7-14. --Gordan, 1956, p. 340.

MATERIAL EXAMINED: Thirty-five specimens from five areas.

Holotype male: Montserrat; 120 fms., "Blake" sta. 157; specimen 42 mm. long, in a scaphopod 65 mm. long.

South Carolina: 32° 47' N., 78° 15' W.; 90 fms.; Feb. 14, 1940; "Pelican" sta. 183-3; 1 female.

Southern Florida: 24° 18' N., 81° 48' W.; 133 fms.; Feb. 19, 1902; "Fish Hawk" sta. 7286; 1 female, 1 in an anemone. 24° 17' N., 81° 58' W.; 132 fms.; Feb. 14, 1902; "Fish Hawk" sta. 7280; 3 males, 2 in scaphopods, 1 in a U-shaped, calcareous tube. 24° 21' N., 81° 52' W.; 109 fms.; Feb. 19, 1902; "Fish Hawk" sta. 7282; 1 male, 3 in scaphopod shells. Off Fowey Rocks and Miami; 30-100 fms.; 1916; J. B. Henderson; 3 males. Off Key West and Sambo Key; 61-135 fms.; J. B. Henderson; 2 males, 4 females (2 ovig.), 3 in scaphopods surrounded by single anemones.

Off mouth of Orinoco River: 09° 45' N., 59° 45' W.; 200 fms.; Nov. 4, 1957; "Oregon" sta. 1989; 1 male.

Off mouth of Amazon River: 02° 35' N., 47° 48' W.; 120 fms.; Nov. 15, 1957; 4 males, 7 females (1 ovig.); 1 juv.

RANGE: South Carolina to mouth of Amazon River (not yet taken in Gulf of Mexico), 30 to 508 fms. (Milne Edwards

and Bouvier, 1893).

DIAGNOSIS: Major cheliped massive, short; face of chela rounded to form an operculum in a scaphopod shell. Body and appendages in shape of long, straight cone.

DESCRIPTION: Carapace smooth, evenly rounded; shield longer than cardiac plate. Rostrum triangular, exceeding ophthalmic ring. Lateral teeth blunt, scarcely exceeding frontal margin. Eyes heavy, short, little swollen at cornea. Eye scales long, triangular; edges raised; subapical spinule prominent. Terminal segment of retracted antennular peduncle almost reaches cornea. Second segment of antennal peduncle armed with a minute spinule on inner angle, an outer projection forming a strong spine. Terminal segment extending to midpoint of cornea. Acicle lightly setose, slightly exceeding cornea.

Major cheliped short, propodus subequal to rest of leg. Carpus truncate, with transverse, granular ridges dorsally, a denticle immediately behind inner hinge. Proximal part of propodal surface less than a fourth as long as opercular surface. Opercular margin of fine denticles directed perpendicular to surface on proximal half, in same plane on distal half. Opercular surface makes an angle of about 120 degrees with rest of cheliped. Dactyl broad, closing without a gape and contributing perfectly to operculum. Teeth calcareous, very blunt; corneous tip on dactyl.

Minor cheliped small, only carpus visible from above.

Carpus armed with uneven spines on dorsal angle and disto-dorsal margin. Chela about twice as long as wide; gape absent; many tufts of fine setae ventrally and laterally on pollex, distoventrally on dactyl.

Walking legs equal to major cheliped. Carpus with two dorsal rows of denticles, the inner row terminating in a short spinule. Dactyl short, compressed; claw sharp, yellow corneous, a third as long as rest of dactyl; spinulose setae on distal ventral and dorsal margins. Propodus of fourth pereopods short, with a row of strong scales on ventral margin. Propodus of fifth pair with rasp on distal fourth-fifths of ventral surface and distal half of outer surface.

Sternum between third pair of coxae supports a short, rounded projection. Wide sternum between fourth pair bears abundant setae and several peculiar swollen hairs. Sternum between fifth pair about half as wide, rounded distally and with the same swollen hairs. Females lack these odd hairs. Paired pleopods of female small, approximated. Egg mass numbers about 200, each egg 0.5 mm. in diameter. Posterior abdominal appendages subsymmetrical; terminal lobes of telson each ending in a strong spine, with several smaller spines on inner margins.

COLOR: Striking pattern of red and lighter hues appears on anterior appendages. Eyestalks with a narrow red band at level of tips of eye scales, with apricot on remaining surface to cornea. Major cheliped with fine, bright red,

dorsal margins distally on merus and carpus, proximally on propodus and on raised proximal edge of opercular surface. Remaining color varies from salmon to apricot, except for three large, white patches forming a triangle around center of opercular surface and white ends of fingers. Minor chela with a red band proximally and a red patch next to base of dactyl. Walking legs with red bands of varying width and intensity at several points.

MEASUREMENTS (mm.): Total length 40; shield, length 5.8, width 5.0; carapace 9.6; eyes 2.9; major chela, length 9.4, width 7.4, dactyl 5.6; minor chela, length 4.5, width 2.2, dactyl 2.8; third leg, basis-ischium 2.5, merus 4.6, carpus 4.8, propodus 3.5, dactyl 5.8.

REMARKS: Only male specimens bear the swollen hairs on the fourth and fifth sterna. A male from "Oregon" sta. 2084 has three rhizocephalans attached and also lacks the unusual appendages.

Pyloragurus erosus (A. Milne Edwards)

Eupagurus erosus A. Milne Edwards, 1880, p. 42.

Pyloragurus erosus Milne Edwards and Bouvier, 1893, p. 89, pl. 6, figs. 27-30; Gordan, 1956, p. 340.

MATERIAL EXAMINED: Three specimens from Barbados.

Barbados: Holotype ovig. female, MCZ 4089; 73 fms.; "Blake" sta. 290. 103 fms.; "Blake" sta. 273; 1 male. 84

fms.; "Blake" sta. 296; 1 female.

RANGE: Barbados and St. Vincent; 73 to 210 fms.

DIAGNOSIS: Stalked tubercles of major chela and margin of minor chela unusually large, widely spaced, and irregularly sculptured.

DESCRIPTION: Shield glabrous, as broad as long.

Cardiac plate very short. Eyes with cornea moderately swollen. Eye scales triangular, each with minute subapical spines. Antennular peduncle equals eyes. Antennal peduncle reaching cornea; acicles small, with a minute terminal spinule. Flagellum fine, with a few long hairs.

Major chela with unusually large tubercles, generally well separated, and each with a different, but similar shape. Outer margins of fingers armed with a few rounded teeth which project from outer parts of large tubercles. Sparse setae encircle chela along margins. Dactyl with two rows of wide, sculptured tubercles. Cutting edges of fingers present uneven calcareous teeth.

Carpus of minor cheliped armed with six dorsal spines. Chela presents ten strong spines with minute, corneous tips on outer margin. At least 20 bulb-like tubercles appear between this margin and a line running back from apex of cutting edges.

Walking legs short; dactyls with stiff setae rising from serrate dorsal edge, five corneous spinules on ventral angle. Claws curved and sharp. Propodus of fourth pereio-

opods with long-scaled rasp distally. Dactyl short, with a row of fine scales. Chela of fifth pereopods with a rasp on distal three-fifths of outer surface.

Sternum separating third maxillipeds has a spinule on each side of median indentation. Coxae of third legs approximated, with only a narrow, short projection between them. Posterior abdominal appendages subsymmetrical; telson unarmed. Abdomen short, uropods reaching fifth pereopods.

MEASUREMENTS (mm.): Shield, length 3.5, width 3.5; carapace 4.9; eyes 3.3; right chela, length 6.0, width 4.4, dactyl 3.1; third right pereopod, basis-ischium 1.3, merus 3.0, carpus 2.7, propodus 2.6, dactyl 3.5.

Pylopagurus gibbosimanus (A. Milne Edwards)

Eupagurus gibbosimanus A. Milne Edwards, 1880, p. 42.

Pylopagurus gibbosimanus Milne Edwards and Bouvier, 1893, p. 99, pl. 7, figs. 18-20. --Gordan, 1956, p. 340.

MATERIAL EXAMINED: Three specimens from two stations.

Ovigerous female type; Martinique; 170 fms.; "Blake" sta. 906.

Off mouth of Amazon River: 02° 35' N., 47° 48' W.; 120 fms.; Nov. 15, 1957; "Oregon" sta. 2068; 2 males.

RANGE: Milligan Key to mouth of Amazon River; 120 to 270 fms.

DIAGNOSIS: Right chela massive, with unusually high

ridges; surface projections meshing perfectly, slightly rounded above. A small species.

DESCRIPTION: Shield glabrous, broader than long.

Rostrum obtuse, equaling lateral teeth. Eyes shorter than shield, moderately swollen at cornea. Eye scales triangular, short; margins raised, subapical spine strong. Antennular peduncle exceeding eye by half of terminal segment. Antennal peduncle barely exceeding eye; acicle feeble, reaching cornea. Flagellum scarcely equaling pereopods; several long setae and numerous minute setae present.

Major cheliped strong; carpus with a few short spines or denticles on inner dorsal margin. Chela heavy, uniquely ornamented; margin present only on inside. High, uneven ridges extend from proximal margin of hand to tips of pollex and dactyl. Perfectly meshing projections cover dorsal surface of chela. Minor cheliped with two rounded spines distodorsally. Chela with projections covering outer three-fourths of surface.

Walking legs short, sparsely setose above and below, lightly armed with corneous spinules on distoventral angle of propodus and ventral angle of dactyl. Propodal rasp of fourth pereopods four scales wide; rasp of fifth covering distal three-fifths of outer surface. Sternal projection between third coxae longer than broad, with two unusually swollen hairs at tip; sterna between fourth and fifth coxae also bear these hairs.

Abdomen short; posterior half covered with fine, short setae. Male pleopods completely uniramous. Bases of uropods each armed with a strong denticle on outer distal margin. Telson short, asymmetric, unarmed.

COLOR: (Specimen from "Oregon" sta. 2068 after one year in alcohol). Shield with a coral spot near posterior end of each lateral groove. Eyestalks burnt sienna distally fading to cream at bases. Dorsal surface of carpus of chelipeds with salmon vermiculations. Chelae light apricot with darker color showing at junctions of projections. Broad transverse bands on all pereopods range from coral to salmon.

MEASUREMENTS (mm.): Shield, length 2.5, width 2.6; carapace 4.1; eyes 2.2; major chela, length 4.8, width 3.3, dactyl 2.7; minor chela, length 3.1, width 1.5, dactyl 1.6; third pereopod, basis-ischium 1.5, merus 3.1, carpus 2.1, propodus 2.4, dactyl 3.0.

Pylodagurus hendersoni n. sp.

MATERIAL EXAMINED: Holotype female (ovig.); southeast of Sand Key Light, Fla.; 61 fms.; J. B. Henderson. Paratype female (apparently a cast); off Texas; W. G. Hewatt.

RANGE: Florida Straits and off Texas.

DIAGNOSIS: Small species, near P. serratus. Major chela differs in presence of fewer and stronger teeth in

margin, strong teeth or blunt spines in proximal end of median dorsal ridge of palm, much stronger ridge on dactyl.

DESCRIPTION: Eyes equaling shield. Antennal acicles fine, scarcely reaching cornea. Flagellum slender, subequal to pereopods.

Major cheliped appears midway between those of P. gibbosimanus and P. serratus. Carpus with five spines or denticles on inner dorsal angle. Lateral margins of chela composed of quite even, strong teeth, flattened at their extremities. A few strong teeth in proximal border including three at beginning of median ridge. Longitudinal ridge of dactyl strong, with two rows of meshing plates.

Minor cheliped with five spines on outer dorsal ridge of carpus. Chela with two proximal spines and an outer margin of strong teeth. Pereopods as in serratus and bartletti; fourth with four rows of scales in propodal rasp. Female holotype carries about 70 eggs, each .5 mm. in diameter.

MEASUREMENTS (mm.): Holotype. Shield, length 2.4, width 2.5; carapace 3.5; eyes 2.4; major chela, length 4.5, width 3.0, dactyl 2.0; minor chela, length 2.9, width 1.3, dactyl 1.5.

Pylonagurus guianensis n. sp.

MATERIAL EXAMINED: Holotype male, 3 paratypes (1 male,

2 in bryozoan dwellings); 05° 57' N., 52° 20' W., 28-31 fms.; Sept. 11, 1958; "Oregon" sta. 2307.

RANGE: Known only from types.

DIAGNOSIS: Differs from P. corallinus in having face of major chela more produced, depressions inside of margins much smaller; denticles of face fewer in number and less spinous. Separation of third pair of coxae is an even more noticeable difference. Intercoxal projection rounded at tip and supporting a few setae rather than being spinous.

Color and measurements similar to those of corallinus.

Pylodagurus hispidus (Benedict) n. comb.

Eudagurus hispidus Benedict, 1892, p. 26.

Pagurus hispidus Gordan, 1956, p. 330.

MATERIAL EXAMINED: Male holotype, USNM 7759; off Havana, Cuba; 23° 10' N., 82° 20' W.; 133 fms.; Apr. 30, 1884; "Albatross" sta. 2163; coral bottom.

RANGE: Known only from the type.

DIAGNOSIS: Major chela bizarrely sculptured, with a prominent boss on dorsal surface.

DESCRIPTION: Carapace smooth; shield evenly rounded, with shallow longitudinal grooves behind lateral teeth. Rostrum very broad; exceeding lateral teeth. Cardiac plate lightly calcified.

Eyes about three-fourths as long as shield, cornea swollen; eye scales of typical Pagurus shape, with subapical

spinule. Unextended antennular peduncle reaches cornea; flagellum bears very fine setae on underside. Antennal peduncle long, exceeding eyes by terminal segment; flagellum slender, with a few fine setae.

Major chela large; face unusually sculptured; a high, rounded boss rises perpendicularly from surface behind gape; two deep depressions lie posterior to boss; lateral depression more shallow, connected with edges by six clefts in raised margin. Ridges on fingers flank cutting edges; entire surface of hand covered with irregular tubercles, long bases of which may be seen from sides. Cutting edges of both fingers with a few irregular, calcareous teeth.

Minor chela with large tubercles along outer edge, becoming progressively shorter toward inside, ending in two rows of small, corneous-tipped tubercles. Large tubercles on outer margin each bear a calcareous, thumb-shaped projection with a minute, corneous cap. Cutting edges of fingers evenly serrate, composed of a few minute, calcareous teeth interspersed with corneous scales. Sculpturing on dactyl consists only of low, corneous-tipped tubercles which occur mainly in a row along outer edge. Sparse setae appear on margins and beneath fingers.

Second pereopods with setae rising from five indentations on dorsal surface of merus, and heavier, corneous setae from four similar points on ventral side. Dactyl with corneous setae at eight points on dorsal margin and five long,

corneous scales along ventral margin. Corresponding areas of third pereopods bear fine setae; only two corneous scales distally on ventral margin of dactyl.

Approximated bases of third pereopods leave no room for a median sternal projection; however, swollen hairs appear inside coxae of third pair and on sternum separating fourth coxae. Coxal openings of fifth pair each marked by a protuberance bearing a tuft of setae distally. Telson symmetrical, with the calcified distal lobes unarmed.

MEASUREMENTS (mm.): Shield, length 3.2, width 3.2; carapace 4.5; eyes 2.5; major chela, length 5.0, width 3.8, thickness, to raised margin 1.8, to top of boss 3.0; minor chela, length 4.0, width 2.0.

Pylonagurus rosaceus Milne Edwards and Bouvier

Pylonagurus rosaceus Milne Edwards and Bouvier, 1893, p. 97, pl. 7, fig. 10-17. --Gordan, 1956, p. 340.

MATERIAL EXAMINED: Twenty-two specimens from four stations.

Holotype female: Grenada; 92 fms.; "Blake" sta. 253; 1 female.

North Carolina: 33 mi. south of Cape Lookout light-ship; July 8, 1915; "Fish Hawk"; 1 male.

Florida: Key West, off Western Dry Rocks; 65 fms.; J. B. Henderson; 1 male.

Surinam: 07° 25' N., 54° 35' W., 75-80 fms., Sept. 8, 1958; "Oregon" sta. 2289; 15 males, 4 females (3 ovig.).

RANGE: North Carolina to Surinam; 80-92 fms.

DIAGNOSIS: Face of major chela rounded; tubercles with scalloped margins, dorsal surface raised to form a strong dorsal tooth. Walking legs striped.

DESCRIPTION: Shield glabrous, evenly convex; rostrum scarcely exceeding lateral teeth, flanked by two or three strong setae on each side. Eyes strong, subequal to shield. Eye scales typical, well separated. Retracted antennular peduncle reaches base of cornea. Antennal peduncle reaches cornea when extended. Acicles subequal to eyes. Flagellum equaling pereopods, shorter than major cheliped; one or more long setae at irregular intervals.

Major cheliped long, massive. Dorsal surface of carpus with scattered short spinules and numerous long setae; inner margin with six spines. Face of chela covered with usual mushroom-like tubercles, each with a scalloped edge and a strong dorsal tooth. Surface of palm evenly convex, of pollex flat; dactyl with a strong ridge. Margin consists of strong, blunt teeth. Fine setae rise from base of each tubercular tooth. Strong setae form a fringe below margins.

Minor cheliped reaching dactyl of major. Carpus with eight spines on dorsal angle. Chela typical, with tubercles small and margin of strong teeth only on outer edge. Walking legs with a minute distodorsal spinule on merus of each.

Dactyls with usual corneous setae above and below; claws strong.

Fourth pereopods with uniseriate rasp; propodus of fifth with rasp on distal two-thirds. Sternal plate separating third maxillipeds lacks spinules. Males present numerous swollen hairs on rounded projection between third pair of coxae, on sternal plate between fourth pair, and at ends of plate separating last pair. Females lack these hairs. Male pleopods present short outer ramus. Distal lobes of telson asymmetric; each armed with four sharp spines.

COLOR: Specimens from Surinam after four months in formalin. Thorax and abdomen dark, apparently because of chemical action. Shield symmetrically marked with spots of Indian red. Antennular peduncle violet. Eye stalks pale above, red below. Chelipeds apricot on faces of chelae to orange vermillion on merus and carpus. Walking legs with three burnt orange stripes on outer sides, one stripe on dactyl; claws dark amber.

MEASUREMENTS (mm.): Male from Surinam. Shield, length 4.7, width 4.8; carapace 8.2; eyes 4.6; right chela, length 10.0, width 5.5, dactyl 5.0; left chela, length 6.6, width 2.6, dactyl 3.9; third right pereopod, basis-ischium 4.3, merus 5.8, carpus 4.6, propodus 5.8, dactyl 9.0.

Pylonagurus serratus n. sp.

MATERIAL EXAMINED: Holotype female; off Honduras; 15° 15' N., 81° 19' W.; 145 fms.; Aug. 25, 1957; "Oregon" sta. 1894.

RANGE: Known only from type.

DIAGNOSIS: Similar to P. bartletti. Differs as follows: Major chela with interlocking tubercles only slightly rounded on faces, not denticulate. Margin composed of even denticles on outer edge; inner edge less even but not forming spines. Dactyls longer and more slender. Antennae easily surpassing pereopods.

DESCRIPTION: Carapace smooth, nearly nude. Rostrum and lateral teeth equal. Eyes short, much swollen at cornea; scales widely spaced, typical of genus. Antennular peduncle exceeding eyes by two-thirds of terminal segment. Antennal peduncle a little shorter. Second segment with a minute denticle at inner angle and tip of outer projection.

Carpus of major cheliped with six short spines on inner dorsal margin. Chela with two similar spines at base of inner margin, remainder of margin composed of strong, mostly bifid, denticles. Tubercles small, finely toothed margins interlocking completely. Proximal border of face of chela has only two denticles projecting above tubercles. Outer margins of both chelae serrate, composed of small denticles pointing forward and little elevated. Carpus of minor

cheliped with a distodorsal row of about five denticles.

Walking legs slender, dactyls especially so. Setae on dorsal angles stiff, sparse. Dactyls not twisted; claws fine, sharp. Rasp of fourth pereopods has about six scales in each diagonal row. Rasp of fifth covering distal half of propodus; a narrow double row on dactyl.

Thumb-like plate between coxae of third pereopods supports four swollen hairs, the median two much larger. Female gonopods quite strong and closely spaced. Eggs number about 100, each 1.0 mm. in diameter. Telson sub-symmetrical, lightly toothed on median notch.

COLOR: After one year in alcohol, specimen shows color only in a red dot at base of cutting edge on dactyl of minor chela.

MEASUREMENTS (mm.): Shield, length 4.4, width 4.5; carapace 6.5; eyes 3.0; major chela, length 8.0, width 5.5, dactyl 3.8; minor chela, length 6.6, width 2.5, dactyl 3.5; third right pereopod, basis-ischium 3.1, merus 5.2, carpus 3.8, propodus 4.2, dactyl 7.0.

Genus Spiropagurus Stimpson

Shield well calcified, glabrous, sparsely setose and much longer than cardiac plate. Eyes short, stout; cornea greatly dilated. Antennular peduncle exceeding eyes by most or all of terminal segment. Acicles of antennae equaling or

exceeding eyes, flagellum long, nude.

Right cheliped not much larger than left. Fourth pereopods tending towards subchelate; rasp of propodus uniseriate. Fifth pereopods subchelate, distal rasp small.

Pleopods biramous, four in females, three in males. Telson deeply cleft at midline, armed with spinules. Left vas deferens usually forming at least one complete circle. Right vas deferens not normally protruding.

Gill pairs 11; West Indian species with gill lamellae quadriseriate, filiform at tips.

Key to Species

1. Carpus and chela of right cheliped armed on faces and margins with abundant spinules.....iris.
Right cheliped armed with a few feeble denticles.....2.
2. Antennal flagella exceeding pereopods by one-half. Eyestalks lacking a proximal swelling.....edwardsi.
Antennal flagella only equaling pereopods. Eyestalks swollen on proximal half.....dispar.

Spiropagurus dispar Stimpson

Spiropagurus dispar Stimpson, 1858, p. 88. --Gordan, 1956, p. 341. --Not Spiropagurus dispar Milne Edwards and Bouvier, 1893, p. 118, pl. 9, figs. 1-6.

Spiropagurus caribbensis Milne Edwards and Bouvier, 1893, p. 116, pl. 8, figs. 26-30. --Monod, 1939, p. 560. --Gordan, 1956, p. 341.

MATERIAL EXAMINED: Twelve specimens from nine localities.

South Carolina: 32° 34' N., 79° 05' W.; 19 fms.; Mar. 9, 1940; "Pelican" sta. 194-10; 1 male.

Florida: 30° 19' N., 86° 15' W.; 12 fms.; Mar. 4, 1939; "Pelican" sta. 141-1; 1 male. 29° 28' N., 85° 31' W.; 12 fms.; Feb. 1, 1956; "A. A. Jakkula"; 2 males, 1 female. Deadman Bay; 29° 35' N., 83° 56' W.; 9½ fms.; Nov. 7, 1901; 1 male. Tortugas; 20 ft.; June 11, 1925; W. L. Schmitt; 2 males, three mi. north of Loggerhead Key on shoals; 10-25 ft.; W. R. Taylor; 1 ovig. female. Tortugas; 16 fms.; J. B. Henderson, 1 male. Eight mi. east of Destin, Fla.; 14 fms.; Oct. 1941; T. J. McGinty; 1 male.

Cuba: "from sponge"; Apr. 8, 1931; P. Bartsch; 1 male.

Bahamas: Off Mathew Town, Great Inagua Id.; August 1, 1938; R. A. McLean and B. Shreve; 1 male.

Puerto Rico: Ponce; Jan. 30, 1899; "Fish Hawk"; 1 male (found with types of Pagurus marshi Benedict). Flannegan Passage; 27 fms.; "Blake" sta. 152; 1 male (type of S. caribbensis).

RANGE: South Carolina, eastern Gulf of Mexico, to Guadeloupe; 20 ft. to 27 fms.

DIAGNOSIS: Eyestalks swollen on proximal half. Antennal flagella equaling pereopods. Dactyl of second pereopod with two ventral rows of stiff setae and a more dense dorsal row.

DESCRIPTION: Shield slightly wider than long, evenly convex. Stiff setae appear in patches on each side of gastric

region, just behind marginal depressions, on rostrum, post-cervical plate and along sides of entire carapace.

Eye stalks somewhat swollen on lower half; cornea less swollen than in S. edwardsi. Eye scales minutely bifid at tips. Antennal and antennular peduncles similar to those of edwardsi but shorter in relation to eyes; acicle more setose. Antennal flagellum not reaching tips of walking legs.

Major chela has low spines and denticles on inner margin of carpus and propodus, short spines on anteroventral angles of merus. Chelipeds differ from edwardsi chiefly in fine setae covering much of dorsal and lateral surfaces, particularly on hands. After two years in alcohol one chela still shows a narrow orange-red line on hand at base of dactyl and a transverse line on each finger about one-third of length from tip.

Walking legs with rows of sparse setae; dactyl much less setose than in edwardsi but with a row of fine, corneous spinules on inner ventral margin. Fourth pereopods similar to those of edwardsi but much more setose. Propodus of fifth has a much more extensive rasp than in edwardsi.

Vas deferens appears enclosed in a curved tube not reaching carpus of fifth pereopod; from this tube it protrudes far enough to form a small circle. External ramus of unpaired pleopods one-third as long as internal. Telson bordered by two diagonal plates, well armed distally.

MEASUREMENTS (mm.): Shield, length 2.8, width 2.8;

carapace length 4.4, width 1.6, finger 1.8; 3rd. leg, merus 2.5, carpus 1.1, propodus 2.5, dactyl 4.0.

Spiropagurus edwardsi n. sp.

Spiropagurus dispar? Milne Edwards and Bouvier, 1893, p. 118, pl. 9, figs. 1-6.

MATERIAL EXAMINED: Male holotype, MCZ 126688, south of Cuba; 22° 36' N., 78° 19' W.; 235.; Apr. 28, 1939; "Atlantis" sta. 3401. Male paratype (MCZ 4006); Barbados; 100 fms.; "Hassler", (Spiropagurus dispar of Milne Edwards and Bouvier, specimen now missing chelipeds as well as acicles).

RANGE: Cuba to Barbados; 100 to 235 fms.

DIAGNOSIS: Eyestalks not swollen on lower half, cornea greatly swollen. Antennal flagellum exceeding pereopods by one-half. Dactyl of walking legs with two rows of long, closely spaced setae, all short-plumose on one side except near dactylar tip.

DESCRIPTION: Shield slightly wider than long; smooth and evenly convex; rostrum rounded, equaling spine-tipped lateral teeth. Cardiac plate lightly calcified, narrowed at midpoint. Gill cover membranous; right in holotype conceals an isopod half again as long as shield of carapace.

Eyes shorter than shield, stalks narrowest at base, evenly swollen to base of cornea; latter expanded to twice

width of base of stalk. Eye scales narrow, bifid distally into two spines; widely separated.

First segment of antennal peduncle with a spine on each anterior angle. Distal segment exceeds cornea by over half its length. Acicle exceeding eye, armed with a few weak spinules on inner margin. Antennal flagellum nude, exceeding chelipeds by more than length of carpus and propodus. Antennular peduncles exceeding eyes by most of last segment.

Chelipeds slender; each armed on merus with two spines at each anteroventral angle; carpus with a row of about eight spines on both dorsal angles. Chelae with a row of small spinules on inner dorsal margin of each hand, sparse fringes of setae on both sides. Fingers narrow, meeting along entire gape; teeth minute on minor chela, larger and widely spaced on major chela.

Walking legs long, slender; fine spinules appear dorsally on carpus, inner side of propodus and on dactyl. Setae near tips of dactyl stiff; tips long, sharp, pale in color. Fourth pereopods short; uniseriate rasp of about nine scales on lower margin of propodus. Propodus of fifth pereopods subchelate, with a rasp on margins of distal half. Projecting plate between bases of third pair of pereopods over twice as wide as long, with about ten spinules on leading edge. Sternal plate between fourth pair long and narrow.

Vas deferens makes about $1\frac{1}{2}$ turns and exceeds fifth pereopod. Unpaired pleopods feeble, with a short external

ramus. Telson almost symmetrical; tip bilobed and spinulose.

This species is named in memory of Alphonse Milne Edwards, who, together with E. L. Bouvier, did the most important work on the Caribbean pagurids to date.

MEASUREMENTS (mm.): Holotype male; shield, length 2.2, width 2.4; carapace length 3.5; eyes 1.6; major chela, length 3.3, width 1.1, finger 1.5, third leg, basis-ischium 1.2, merus 2.8, carpus 1.5, propodus 3.0, dactyl 4.7.

Spiropagurus iris (A. Milne Edwards)

Spiropagurus iris A. Milne Edwards, 1880, p. 44.

--Gordan, 1956, p. 341.

RANGE: Barbados to Grenada; 73 to 103 fms.

DIAGNOSIS: (After Milne Edwards and Bouvier, 1893).

Shield with a narrow raised margin between lateral teeth; latter triangulate, in advance of obsolescent rostrum. Eyes very dilated, much shorter than frontal margin. Eye scales broadened at bases, bifid at tips. Antennular peduncles exceeding eyes by all of terminal segments. Second segment of antennal peduncle with an unusually long outer spine; acicle easily exceeding eyes.

Sternal plate separating outer maxillipeds with a small median indentation; merus of third maxillipeds with a strong distal spine.

Chela of chelipeds armed with small spines dorsally and in regular margins. Carpus well armed with spines, merus with a few spinules. Walking legs strong and much longer than chelipeds, dactyls much longer than propodus. Vas deferens strong and coiled on itself.

Genus Sympagurus Henderson

This genus is separated from the genus Parapagurus only on the basis of having biseriate rather than quadri-seriate gills. Since some evidence of intergradation between these two genera exists, it is somewhat doubtful as to whether they should be separate genera (Milne Edwards and Bouvier, 1893).

In both genera the shield tends to be broader than long, with few indentations and the rostrum a broad triangle exceeding the obsolescent lateral teeth. The eyes in Sympagurus are usually stronger, with the cornea swollen. In both the antennal flagellum tends to exceed the pereopods.

The right chela is much larger than the left with both often covered with a fine pubescence. The walking legs are long; the dactyl much longer than the propodus. The propodal rasp of the fourth pereopods is usually composed of several rows of minute scales but both genera have at least one species with a single row.

A female opening occurs only on the third left coxa. Males present two pairs of gonopods.

Key to Species

1. Face of major chela obscured by setae.....2.
Face of major chela easily visible.....3.
2. Chelipeds entirely covered, except at fingertips, with fine, pilose hair.....pictus.
Only dorsal surface of major chela and carpus obscured by setae.....pillimanus.
3. Major chela with a strong ridge of denticles running from midpoint at base of hand to angle of cutting edges of fingers; ridge separated from sharp dentate inner margin by a broad depression.....bicristatus.
Major chela with only weak denticles above and without a groove..... arcuatus.

Sympagurus arcuatus Milne Edwards and Bouvier

Sympagurus arcuatus Milne Edwards and Bouvier, 1893,

p. 67, pl. 5, figs. 21-28. --Gordan, 1956, p. 341.

Pylonagurus exquisitus Boone, 1927, p. 71. --Gordan, 1956, p. 340.

MATERIAL EXAMINED: Eight specimens from four stations;

Holotype female: St. Lucia, 164 fms., "Blake" sta. 218.

Off Honduras: North of Gorda Bank, 16° 39' N., 82° 29' W., 225 fms.; Aug. 21, 1957; "Oregon" sta. 1870; 3 males.

Off mouth of Orinoco River: 09° 45' N., 59° 45' W.; 200 fms.; Nov. 4, 1957; "Oregon" sta. 1989; 1 male.

Off mouth of Amazon River: 01° 45' N., 46° 46' W.; 275 fms.; Nov. 18, 1957; "Oregon" sta. 2084; 2 males, 1 ovig. female.

RANGE: (In western Atlantic). Western Caribbean to mouth of Amazon, 138 to 275 fms. Also found as subspecies in Arabian Sea, Indian Ocean and Antarctic regions.

DIAGNOSIS: Walking legs longer than body. Major chela with dentate inner and outer ridges; sparsely pubescent above. Corneas moderately swollen.

DESCRIPTION: Shield evenly rounded in back. Rostrum rounded, scarcely exceeding lateral teeth. Eyes small, swollen at corneas. Eye scale small, forming a strong spine. Antennular peduncle long, exceeding eye by elongate terminal segment. Base of antennal peduncle with minute outer spinule; second segment with a sharp spinule on inner angle and at tip of outer projection; fourth segment with distodorsal spinule; terminal spinule not exceeding cornea. Acicle strong, with ten spinules on inner margin. Flagellum often exceeding pereopods, nude except for long stiff setae at three or four points.

Major cheliped with ten strong teeth on inner ventral angle of merus. Dorsal surface of carpus finely dentate above; several short spines on inner distal margin. Merus and carpus with dense pubescence below, cheliped sparsely pubescent elsewhere. Chela with inner and outer margins of sharp denticles. Subchelate dactyl closing without a gape. Minor cheliped small, armed with a single distodorsal spine on carpus. Chela slender, curved, with long dactyl.

Walking legs long, unarmed; dactyls especially long,

each with crest of strong setae on inner dorsal edge; claw very minute. Rasp on propodus of fourth pereopod a single row of scales. Propodus of fifth subchelate with triangular rasp fronting on distal dorsal margin. Male gonopods feeble, unpaired pleopods with a slender, minute outer ramus. Telson asymmetrical, larger left lobe armed with corneous spinules.

MEASUREMENTS (mm.): Male from "Oregon" sta. 1870: Shield, length 4.5, width 4.5; carapace 6.8; eyes 3.3; major chela, length 9.0, width 7.0, dactyl 6.2; minor chela, length 5.0, width 1.3, dactyl 2.5; third pereopod, basis-ischium 2.9, merus 4.6, carpus 4.6, propodus 4.8, dactyl 9.6.

Sympagurus bicristatus (A. Milne Edwards)

Eupagurus? bicristatus A. Milne Edwards, 1889, p. 43.

Sympagurus bicristatus Milne Edwards and Bouvier, 1894, p. 69, pl. 11, figs. 1-15. --Gordan, 1956, p. 341.

RANGE: Virgin Ids., eastern Atlantic, Mediterranean Sea and Indian Ocean; 218 to 835 fms. (taken once at 54 fms.).

DIAGNOSIS: (after Milne Edwards and Bouvier, 1893).

Shield well calcified, distinctly separated from branchial regions. Spine terminating third article of antennal peduncle larger than in S. arcuatus.

Denticles on merus and carpus less pronounced except on ventrodistal border of carpus. Hand short, high, and

bordered dorsally by two parallel crests of denticles, the inner more elevated than the outer.

Sympagurus nictus Smith

Sympagurus nictus Smith, 1883, p. 37, pl. 5, figs. 2, 2a, pl. 6, figs. 5-8. --Gordan, 1956, p. 342. --Springer and Bullis, 1956, p. 16.

MATERIAL EXAMINED: Seven specimens from five stations.

Off Mississippi Delta: 29° 10' N., 88° 08' W., 240 fms.; "Oregon" sta. 1564; June 22, 1956; 3 ovig. females in anemones, Paracalliactus involvans (McMurrich).

Caribbean Sea: West of Rosalind Bank, 16° 35' N., 80° 55' W.; 100 fms.; Aug. 24, 1957; "Oregon" sta. 1890; 1 male. Barbados; 288 fms.; "Blake" sta. 987; 1 male.

Off Trinidad: 10° 00' N., 59° 59' W.; 250 fms.; Nov. 3, 1957; "Oregon" sta. 1892; 1 male.

Off Surinam: 07° 40' N., 54° 47' W.; 300 fms.; Nov. 7, 1957; "Oregon" sta. 2009; 1 male from shell of Leucosyrinx edgariana Dall.

RANGE: Massachusetts to Surinam; 100 to 315 fms. In Gulf of Mexico found thus far only in northern part from Texas to Florida.

DIAGNOSIS: A large species. Chelipeds long, covered by a dense, fine pubescence; walking legs almost nude. Dactyl of fourth pereopod longer than propodus.

DESCRIPTION: Shield broader than long; well marked median line becoming a ridge on rostrum. Latter prominent, almost equaling ophthalmic ring. Lateral teeth obsolescent. Cardiac plate narrow, poorly calcified. Carapace on either side of cardiac plate uncalcified but stiff and rough, margin-
ed by hair. Gill covers membranous, with dense plumose hair on lower parts.

Eyes short, swollen at cornea; stalks constricted in midregion. Eye scale small, forming stout, terminal spine. Antennular peduncles slender, exceeding eyes by most of terminal segment. Antennal peduncle scarcely exceeding eye; second segment armed with a denticle on inner angle, six denticles on inner dorsal margin of stout, outer projection. Acicle strong, feebly armed on distal inner margin. Flagellum nude, exceeding pereopods.

Chelipeds similar except in proportion; strong denticles on upper surfaces obscured by dense coat of feathery hair completely covering both chelipeds. Cutting edges of fingers composed of strong teeth. Larger teeth faced with minute denticles. General arrangement similar to Pagurus with row of corneous teeth on distal part of dactyl meeting several calcareous teeth on pollex. Minor chela slender, with cutting edges gaping along proximal fourth; corneous edges of pollex unsupported by calcareous teeth.

First walking leg denticulate on ventral margins of ischium and merus; both armed with distodorsal spinule on

carpus. Dorsal surfaces of three distal segments bear several short setae; those on dactyli heavier and forming a dense row distally; five transverse rows appear on inner distal surface of dactyl. Propodus of fourth pereopod with rasp of minute, sparse scales in four rows on distal two-thirds of ventral edge. Dactyl unusually developed, longer than any other segment; row of very minute scales along ventral angle. Subchelate propodus of fifth pereopod with a somewhat triangular rasp on distal three-fourths.

First pair of male gonopods short; second pair long, heavy; both pairs broad-spatulate distally. Unpaired male pleopods with a short outer ramus. Telson asymmetrical, scarcely cleft medially; armed with corneous spinules.

COLOR: A distinctively marked species with a large patch of burnt orange on outer surface of merus of each walking leg. Similar but less intense color appears on shield and posterior abdominal plates. Cornea and short dorsolateral streak on eyestalk Indian red. Paddle-shaped calcareous plate on upper surface of each eyestalk. Dactylar setae of walking legs scarlet.

MEASUREMENTS (mm.): Male from "Oregon" sta. 1982. Shield, length 13, width 15, carapace 22; eyes 7.5; major chela, length 32, width 12.5, dactyl 16.5; minor chela, length 19.5, width 6, dactyl 13; third pereopod, basis-ischium 10, merus 18.5, carpus 11, propodus 19, dactyl 26.5.

Sympagurus pilimanus (A. Milne Edwards)Eupagurus pilimanus A. Milne Edwards, 1880, p. 43.Sympagurus pilimanus Milne Edwards and Bouvier, 1893.

--Gordan, 1956, p. 342.

MATERIAL EXAMINED: Sixty-eight specimens from 35 stations in five areas.

Types: Male; Guadeloupe; 171 fms.; "Blake" sta. 167. Female; St. Kitts; 208 fms.; "Blake" sta. 148.

Texas: 27° 43' N., 95° 05' W.; 300 fms.; May 6, 1956; "Oregon" sta. 1507; 1 male.

Southeastern Florida: 27° 28' N., 78° 44' W.; 215 fms.; Feb. 3, 1957; "Combat" sta. 237; 1 ovig. female; 25° 07' N., 79° 15' W.; 300 fms.; July 23, 1957; "Combat" sta. 447, 1 female; 24° 35' N., 79° 58' W.; 565 fms.; July 25, 1957; "Combat" sta. 452; 1 male.

Cuba: "Atlantis" stations: 26° 08' N., 79° 02' W.; 155 fms.; Feb. 3, 1958; sta. 2951; 2 males, 4 females (3 ovig.). 22° 48' N., 78° 41' W.; 220-260 fms.; Mar. 10, 1938; sta. 2980A; 1 male, 2 females (1 ovig.). 22° 48' N., 78° 48' W.; 220-225 fms.; Mar. 10, 1938; sta. 2980B, 2 males, 2 ovig. females. 22° 47' N., 78° 49' W.; 195 fms.; Mar. 10, 1938; sta. 2981C; 1 male, 1 ovig. female. 22° 48' N., 78° 50' W.; 210 fms.; Mar. 11, 1938; sta. 2982A; 3 males, 2 females (1 ovig.). 22° 44' N., 78° 41' W.; 150-180 fms.; Mar. 11, 1938; sta. 2982E; 1 male, 1 female. 23° 11' N., 79° 08' W.; 235-260 fms.; Mar. 12, 1938; sta. 2983; 2 males. 23° 10' N.,

81° 29' W., 145-230 fms., Mar. 17, 1938; sta. 2999; 1 male.
 22° 13' N., 81° 11' W., 185 fms., Apr. 4, 1939; sta. 3320;
 1 ovig. female. 20° 45' N., 75° 20' W., 230 fms., Apr.
 20, 1939; sta. 3375, 2 males. 22° 33' N., 78° 10' W., 245
 fms., Apr. 26, 1939; sta. 3387, 1 male. 22° 34' N., 78°
 14' W., 200 fms., Apr. 27, 1939; Sta. 3394; 1 male. 22°
 35' N., 78° 19' W., 180 fms., Apr. 28, 1939; sta. 3400; 1
 male. 22° 50' N., 78° 50' W., 215 fms., Apr. 29, 1939; sta.
 3413; 1 male, 1 ovig. female. 22° 50' N., 78° 55' W., 200
 fms., Apr. 30, 1939; sta. 3416; 2 males. 22° 50' 78° 56'
 W., 200 fms., Apr. 30, 1939; sta. 3417, 1 male, 1 female.
 22° 50' N., 79° 08' W., 245 fms., Apr. 30, 1939; sta. 3423; 1
 ovig. female. 23° 05' N., 79° 32' W., 260 fms., May 2, 1939;
 sta. 3437; 1 ovig. female. 23° 13' N., 81° 22' W., 385 fms.,
 May 11, 1939; sta. 3485; 1 male.

Rosalind Bank: 16° 38' N., 82° 34' W., 205-210 fms.,
 Aug. 21, 1957; "Oregon" sta. 1869; 1 female. 16° 39' N.,
 82° 29' W., 225 fms., Aug. 21, 1957; "Oregon" sta. 1870; 1
 female.

RANGE: Texas and Florida to Rosalind Bank and Guadelo-
 upe; 155 to 565 fms.

DIAGNOSIS: Eyes short, strong, dilated distally; a
 calcified, dorsal strip on stalk. Chelipeds covered with
 plain and pilose setae dorsally. Major chela large, oval.

DESCRIPTION: Shield smooth, almost nude; a low median
 ridge on anterior half. Rostrum obsolescent, exceeding

scarcely noticeable lateral teeth but leaving ophthalmic ring exposed. Cardiac plate narrow, vase-shaped.

Eyes short, flattened; broadened distally. Eye scales minute, in shape of a small spine. Antennular peduncles exceeding eyes by most of terminal segment. Antennal peduncles equaling eyes; second segment with a strong outer spine, none on inner angle. Acicle subequal to terminal segment; two or more inner spinules. Flagella equaling pereopods, nude except for two or more fine setae at intervals.

Major cheliped much larger than minor. Dorsal surfaces covered with both simple and pilose setae which almost obscure armament of chela. Latter with short spines on margin and in two rows on face of manus. Teeth on cutting edges of fingers calcareous and strong. Minor cheliped with a dorsal and outer distal spine.

Walking legs armed only with a distodorsal spinule on carpus. Dactyls long, slender, twisted outward at tips, with strong distal setae aiding formation of walking surfaces. Claws short, bent slightly upward. Fourth pereopod with three rows of scales on propodal rasp; fifth subchelate, with a rasp on distal three fifths of propodus. External ramus of male pleopods represented by a minute papilla. Telson asymmetrical, lightly armed distally.

COLOR: Eyestalks dull red except on calcified dorsal strip.

MEASUREMENTS: (mm.): (Female from "Combat" sta. 447).
 Shield, length 8.0, width 8.0; carapace 13.0; eyes 5.8;
 right chela, length 15.0, width 10.0, dactyl 7.5; left
 chela, length 9.5, width 3.2, dactyl 6.0; third right
 pereopod, basis-ischium 6.4, merus 10.2, carpus 7.2,
 propodus 9.0, dactyl 14.6.

Genus Tomonaguiroides Balss

Tomonaguiroides valdiviae Balss

Tomonaguiroides valdiviae Balss, 1926, p. 104. --Gordan,
 1956, p. 342.

MATERIAL EXAMINED: 23° 21' N., 80° 36' W.; 500 fms.;
 May 4, 1939; "Atlantis" sta. 3459; 1 ovig. female, MCZ
 126687. 23° 23' N., 80° 21' W.; 475 fms.; Mar. 14, 1938;
 "Atlantis" sta. 299, 1 female, MCZ 26680. 20° 49' N., 75°
 08' W.; 600 fms.; Apr. 20, 1939; "Atlantis" sta. 3369; 1
 female, MCZ 126683.

RANGE: Cuba, north of Santa Clara and Oriente
 provinces; 475 to 600 fms.

DIAGNOSIS: Shield subquadrate; eyes reduced, cornea
 lacking pigment. Pereopods hairy on dorsal surfaces.
 Right chela almost twice as wide as left, slightly longer.

DESCRIPTION: Shield as wide as long, nearly smooth;
 frontal margin raised, especially between lateral teeth.
 Rostrum and lateral teeth tipped with spines, subequal.

Gastric region outlined by a few tufts of bristles. Postero-lateral borders each flanked by a narrow, calcified plate. Cardiac plate narrow, short; gill covers partially calcified above, with a few scattered setae. Eyes less than half as long as shield, with a bowling pin shape; cornea feebly dilated. Eyestalks with a thick row of setae directed medially and forward on dorsal surface. Antennular peduncle exceeding eyes by terminal article and half of next. Base of antennal peduncle with a spinule on outer margin. Second segment denticulate on inner angle; outer lacking spines, a row of setae on inner edge. Acicle reaching near end of peduncle; latter exceeding eye by terminal article. Flagellum surpassing pereopods, narrowed to a filament and more setose distally.

Right cheliped heavier than left, slightly longer. Ischium and merus with denticles on inner ventral margin; carpus and propodus denticulate on inner dorsal surface near their articulation. Upper surface of carpus and propodus evenly covered with fine setae which hold silt on surfaces. Fingers of major chela meet only at heavy, corneous tips. Both fingers present two strong crushing teeth behind distal corneous edges. Minor chela with fine corneous teeth distally on two-thirds of dactyl and half of pollex; fingers meet closely only on distal half.

Walking legs similar. Carpus with a stout denticle on distodorsal angle. Dactyl shows an even row of setae along

lower inside surface; on the first leg this row is a series of tufts rising from punctae; on the second it consists of about 14 diagonal, overlapping, combs. Dorsal surfaces of propodus and dactyl densely setose. Tip of dactyl short, sharp and corneous.

Propodus of fourth pereopods with a narrow rasp two or three scales wide on distal three-fourths; dactylar rasp uniseriate. Prominent friction points on distal ventral and dorsal angles of carpus allow only a sidewise movement of propodus. Subchelate propodus of fifth pair with a rasp on distal three-fifths of outer surface and a dense patch of setae on lower side.

Sternal plate separating third maxillipeds presents two prominent teeth medially. Eggs resemble clusters of grapes, about 40 on each pleopod; each egg about 1.8 mm. in diameter. Telson symmetrical, feebly armed.

Genus Tomonaguronsis Alcock

Tomonaguronsis problematica (Milne Edwards and Bouvier).

Eunagurus? problematicus Milne Edwards and Bouvier, 1893, p. 151, pl. 11, figs. 1-10.

Tomonaguronsis problematica Alcock, 1905, pp. 137-190.
--Gordan, 1956, p. 342.

MATERIAL EXAMINED: Nine specimens from eight stations.

Male holotype: Off Sand Key, Fla.; 125 fms.; Apr. 13, 1872; "Bache".

?Off Cape Lookout, N.C.: 1 3/4 mi. N.E. of light; 7½ fms.; July 24, 1902; "Fish Hawk" sta. 7302.

Straits of Florida: 25° 12' N., 80° 00' W., 185 fms.; July 25, 1957; "Combat" sta. 453; 1 female from shell of Genota viabrunnea Dall.

Cuba: 23° 05' N., 79° 37' W.; 265 fms.; May 2, 1939; "Atlantis" sta. 3438, 1 male. 22° 08' N., 81° 10' W.; 260-275 fms.; Apr. 5, 1939; "Atlantis" sta. 3328; 1 female.

Caribbean Sea: North of Gorda Bank; 16° 39' N., 82° 29' W.; 225 fms.; Aug. 21, 1957; "Oregon" sta. 1870; 1 male, 1 female. 16° 38' N., 82° 34' W.; 205-210 fms.; Aug. 21, 1957; "Oregon" sta. 1869; 1 male.

Off mouth of Orinoco River: 09° 45' N., 59° 45' W.; 200 fms.; Nov. 4, 1957; "Oregon" sta. 1989; 1 male.

RANGE: ? Cape Lookout, N.C. to mouth of Orinoco River (not yet taken in Gulf of Mexico); 125 to 265 fms. (7½ fm. record doubtful).

DIAGNOSIS: Chelipeds not markedly different. Antennal flagella and dorsal surfaces of pereopods quite setose. Eyes small, scarcely swollen at cornea.

DESCRIPTION: Shield convex in each direction. Rostrum triangular, exceeding lateral teeth. Cardiac plate in shape of an inverted Y. Eyes shorter than shield, faintly swollen at both ends. Eye scales rounded above, curved outward at tips. Antennular peduncles exceeding eyes by half of terminal segment. Antennal peduncle equaling eyes; second segment with

an inner spinule, another on inside near tip of outer projection. Acicle at least equalling eye.

Carpus and propodus of major cheliped finely pubescent dorsally with sparse long setae; surfaces even except for scattered low denticles and an inner dorsal ridge with strong, calcareous spines. Opposing edges of fingers differ from pattern found in genus Pagurus. Pollex with large medial tooth opposing shallow depression on dactyl. Proximal edge of dactyl with three strong teeth, largest most proximal. Edges distal to large tooth on pollex, both corneous, including heavy tips. Minor cheliped similar to larger except for short row of strong denticles on distodorsal surface of carpus and straight cutting edges of fine, corneous teeth on fingers.

Walking legs unarmed, densely setose above; claws fine, short. Propodus of fourth pereopod with a triangular rasp on distal half of ventral surface; dactyl with faint row of scales. Propodus of fifth pereopod covers most of distal half of outer surface. Plate separating third maxillipeds with a median cleft flanked on each side by a strong spine, as in Munidopagurus. Asymmetry marked on ventral part of thorax; coxal pairs well separated. Telson with left lobe more produced, both lobes armed with recurved corneous spinules. Male gonopods quite small, well separated basally. Unpaired pleopods of male with outer ramus a third as long as inner.

COLOR: (Male from "Oregon" sta. 1989 in formalin).
Pereiopods, head appendages, and shield mainly livid pink;
setae straw yellow.

MEASUREMENTS (mm.): Female from "Combat" sta. 453;
shield, length 5.5, width 5.2; carapace 8.5; eyes 3.5;
major chela, length 10.0, width 5.1, dactyl 5.7; minor chela
8.0; third pereiopod, basis-ischium 3.6, merus 4.4, carpus
4.0, propodus 4.4, dactyl 8.0.

REMARKS: The male from "Oregon" sta. 1989 lacks
gonopods, while the male from "Oregon" sta. 1870 has both
gonopods present and also has an opening on the third right
coxa.

Genus Tomopagurus Milne Edwards and Bouvier

Tomopagurus rubropunctatus Milne Edwards and Bouvier

Tomopagurus rubropunctatus Milne Edwards and Bouvier,
1893, p. 71, pl. 6, figs. 1-6. --Gordan, 1956, p. 342.

MATERIAL EXAMINED: Holotype male at MCZ, Barbados; 73
fms.; "Blake" sta. 290.

RANGE: Known only from type.

DIAGNOSIS: (after Milne Edwards and Bouvier, 1893).
Rostrum obtuse, exceeded by acuminate lateral teeth. Eyes
dilated at cornea; exceeded slightly by antennal peduncles,
and by three-fourths of terminal segment of antennular ped-
uncles. Antennal flagella surpasses pereiopods. Sternum
separating external maxillipeds unarmed.

Major chela with face convex and covered with arced spines; marginal spines strongest. Minor cheliped with two dorsal rows of spines on carpus. Chela with a row of dorsal spinules and another on outer margin; smaller spinules and granules between these rows to tip of pollex. Dactyl unarmed.

A single pair of anterior abdominal appendages on male. Telson deeply cleft, lobes denticulate distally.

REMARKS: While Tomopagurus is clearly a valid genus, its characteristics will not be fully known until a female is collected.

Genus Xylonagurus A. Milne Edwards

Xylonagurus rectus A. Milne Edwards

Xylonagurus rectus A. Milne Edwards, 1880, p. 37.

--Schmitt, 1935, p. 207, fig. 67. --Gordan, 1956, p. 342.

MATERIAL EXAMINED: Two specimens from Cuba.

Cuba: 22° 07' N., 81° 08' W.; 155-190 fms.; Feb. 25, 1938; "Atlantis" sta. 2963-A; 1 female. 22° 13' N., 81° 11' W.; 185 fms.; Apr. 4, 1939; "Atlantis" sta. 3320; 1 male.

RANGE: Bahia de Cochinos, Cuba, to St. Vincent; 75 to 185 fms.

DIAGNOSIS: Body elongate, adapted to living in a hollow twig. Tail fan forming an operculum.

DESCRIPTION: Shield glabrous, rounded laterally. Rostrum triangular, covering ophthalmic somite. Cardiac

plate broader behind, shorter than shield. Eyes short, cornea extremely dilated. Eye scales rounded, fringed with about eight teeth. Antennular peduncle strong, exceeding eyes by a third of terminal segment; those of antennae feeble, reaching midway on cornea. Flagellum easily reaching dactyl of walking legs, sparsely setose.

Major cheliped elongate, slightly exceeding walking legs. Chela heavy, feebly setose; fingers short, with large teeth. Minor cheliped feeble, just reaching major chela. Walking legs also feeble, propodus equaling dactyl. Fourth pereopods chelate; propodal rasp broad, oval, composed of very minute scales; dactyl with ten much larger scales. Rasp of fifth pereopods composed of large scales, covering outer surface of chela. Second pair of male gonopods stronger than first. Scales on uropodal rasps strong, recurved.

MEASUREMENTS (mm.): Shield, length 3.7, width 2.4; carapace 5.9, eyes 2.5; right chela, length 5.7, width 2.4, dactyl 2.0; left chela, length 3.1, width 0.7, dactyl 1.8; third pereopod, basis-ischium 2.3, merus 3.7, carpus 1.8, propodus 4.0, dactyl 4.0.

REMARKS: The sharp denticles on the projection at the base of the dactyl in the major chela probably aid, along with the rasps of the uropods, in forming a hole in a twig. The body and appendages are symmetrical except for the chelipeds.

ZOOGEOGRAPHY

Physiography of the Area

The vast body of water and long coastline between Cape Hatteras, North Carolina, and the mouth of the Amazon River seems to present relatively few effective barriers to the distribution of hermit crabs. The region is characterized by extensive shallows extending far offshore in a few areas and by deep water near shore at numerous points. The continental shelf is broad along the Carolinas and Georgia, the west coast of Florida and the northern coast of the Gulf of Mexico except at the mouth of the Mississippi River. An extensive shelf also occurs along the northern and western coasts of Yucatan and east of Honduras and Nicaragua. The Little Bahama and Great Bahama Banks, the Golfo de Batabano between Cuba and the Isle of Pines, and the Golfo de Guacanayabo further east along the southern coast of Cuba are large areas with depths generally under five fathoms.

The remaining coastal areas, those off southeastern Florida, eastern Mexico, British Honduras, Costa Rica, Panama, northern South America, and the islands of the Caribbean generally have very narrow shelves, with the 1,000 fathom line usually not too far offshore. The shelf along the eastern coast of South America north of the mouth of the

Amazon is more extensive than in the areas just mentioned.

Shorelines along the regions of extensive shallows are inclined to be of mud or fine sand with slight wave action. Swampy areas and tidal estuaries occur along this type of coast in sheltered areas. Coral growths and sponge banks are found at many points from North Carolina and north-western Florida south through the Caribbean.

Environmental Relationships

Variations in the ranges of hermit crabs in the western Atlantic appear to be influenced by temperature, bottom type, and depth. Temperature is probably the limiting factor for those species which are restricted to the Carolinian faunal province. These species are found further south along the west coast of Florida than along the east coast but have not been found at Key West or the Dry Tortugas. Seven species found in the Gulf of Mexico and along the Carolina coast are included in this group. Four other species are known only from the northern part of the Gulf of Mexico. Pagurus politus is an abundant species in deep water off the east coast of Florida and ranges to the Dry Tortugas but has not been found in the rest of the Gulf. Pylonagurus coral-linus occurs from the Carolinas to the Straits of Florida and Yucatan but has not been reported south of this region.

At least 24 species present along the Carolinas, in the northern Gulf of Mexico, or in both areas, extend their

range south into the Caribbean Sea or beyond. An additional 36 species have been taken only in the Caribbean area, including the Straits of Florida. Five deep-sea species occur on both sides of the Atlantic. Two species, Clibanarius vittatus and Isocheles wurdemanni, are found in mainland shallows from the Carolinian province to Brazil, yet neither has been taken in the West Indian Islands. This may be due to failure of the planktonic larvae to successfully cross deep-water areas isolating the islands.

Relatively few species can be assigned to definite bottom types on the basis of available information. Species which live on reef or shell bottoms have relatively short, heavy pereopods while those found on loose substrates have the pereopods elongated and slender, with the dactyls twisted and supplied with stiff setae on the margins.

Members of the family Diogenidae are most often found on reef or shell bottoms, at least in shallow water. Some species in the genus Paguristes definitely favor reefs, while members of the genus Clibanarius are equally common in sheltered areas. Pagurus, the largest genus of hermit crabs, is found in many habitats and often at great depths. However, only a few species of small sizes have been found on reefs. Many other species in the genus frequent shell bottoms. The many species of the genus Pylonagurus are composed of rather small species or individuals, most of which are found on the lower shelf or the slope beyond it

where they evidently find a solid substrate, since their walking legs are rather short. Genera adapted by long walking legs for living on soft substrates include Paranagurus, Sympagurus, Catanagurus, Catanaguroides, and Tomonaguroides.

A few species are restricted to certain shell forms or unusual objects as dwellings. Examples are Paguristes spinipes, usually found in Xiphosura shells; Xylopagurus, inhabiting hollowed twigs or reeds at great depths; Cancellus, which, along with several members of the Pylochelidae, lives in hollowed siliceous sponges or stones; and those species which carry anemones when adult. The latter include at least two: Parapagurus pilosimanus and Munidopagurus macrocheles. Species which live in shells with narrow apertures include Isocheles wurdemanni, Paguristes sericeus, P. nunticens, P. gravi, P. depressus and P. triangulatus. Pylonagurus discoidalis lives in scaphopod shells which may later be absorbed by an anemone. P. corallinus and its close relatives are usually housed in bryozoan colonies which absorb the original gastropod dwelling. Species which have been found in the same bryozoan as P. corallinus are Petrochirus bahamensis, Paguristes nunticens, Paguristopsis hummi and Dardanus petersi.

Hermit crabs have been taken at depths down to 1,000 fathoms in the Caribbean, but much greater depths in other parts of the world. On the basis of species numbers, a

rather uniform distribution seems to occur down to at least 200 fms. although individual species may be locally restricted to specific habitats. If the vertical distribution is divided into five categories and species assigned to those in which they have been most frequently taken, we find that 20 species predominate in the littoral down to 10 fms., 14 in the 5-50 fathom range, 16 on the lower shelf or below (50-125 fathoms), 31 at 100-250 fathoms, and seven at depths below 250 fathoms.

Faunal Relationships in the Gulf of Mexico,
Caribbean Sea, Atlantic Ocean, and Eastern Pacific

The numbers of genera and species of pagurids increase strikingly toward the tropics. Only the genus Pagurus is found in the littoral waters of New England while Florida has 12 genera above the ten fathom line. From the Straits of Florida and the depths surrounding Cuba, the composition of the fauna shows no marked change through the Caribbean and south to the Guianas.

At the species level the western Atlantic pagurids most often show affinity with the fauna of the Pacific coast. In several instances closely related species are known which have undoubtedly evolved since the Isthmus of Panama was formed. Only a few examples of speciation within the western Atlantic are obvious. The 15 species in the genus Paguristes form a fairly homogenous group when compared with these from

the western coast of Africa (Forest, 1954a). Those from the Caribbean region have the eye scales well separated and always have both coxal openings present in the female, while several African species have the eye scales approximated and nearly all present a single coxal opening in the female. Paguristes nuncticens, P. gravi, and P. sericeus form a very closely related group of sympatric species. Paguristes tortugae and P. hewatti are closely related but separated geographically and without known intergrades. Only one member of the genus, Paguristes foresti, has its closest relative on the opposite side of the Atlantic.

The genus Pyloragurus, a distinctive group of small pagurids, is almost exclusively American, the number of species found on the Pacific side of the continent possibly equaling the 15 known from the Caribbean region. Only two species, both from South Africa, are known outside of the Americas. One of these is closely related to an American species.

Genera found only in the Caribbean are Tomopagurus, Octopagurus, and Munidopagurus. Genera known from both sides of the New World but not elsewhere are Isocheles, Paguristopsis, and Xyloragurus. Two deep-water genera which are found only in the Atlantic and adjacent seas are Catapaguroides and Tomopaguroides.

Relation to the Fauna in Other Parts of the World

Two areas of the world stand out as centers of speciation and refuges for primitive forms. These are the Indo-Maylayan region with 25 genera and the Caribbean Sea and its adjoining water masses with 29. These areas have 17 genera in common. However, the Indian Ocean and Maylaysian region contain far more species in the Diogenidae, particularly in the genera Dardanus, Clibanarius, Calcinus and Diogenes. The latter genus, a rather large one, is restricted to the Old World. Both regions have many species belonging to deep-water genera in the Paguridae. Two of these genera which occur only in the Indian Ocean and western Atlantic are Tomonaguroopsis and Pylonaguroopsis.

SUMMARY

A systematic study of the hermit crabs in the families Coenobitidae, Pylochelidae, Diogenidae and Paguridae found between Cape Hatteras and the mouth of the Amazon River is presented. The ninety-two species reported include all those found in the Western North Atlantic except for three species from areas north of Cape Hatteras and one from Bermuda. The species reported are placed in 29 genera.

Complete descriptions are given for all species studied in detail. Diagnoses are offered for rare or type specimens for which satisfactory descriptions exist. Keys to the genera of the world and to the included species are presented. Two genera and 19 species are described as new.

Two species and genera which were previously known from the eastern Atlantic are reported from Cuba. These are Catapaguroides microps Milne Edwards and Bouvier and Tompaguroides valdiviae Balss. Cancellus tanneri, known only from the type specimen collected in the Bay of Panama, is also reported from Cuba. The genera Ceratopagurus, Cestopagurus and Pylopaguroopsis are reported from the Atlantic for the first time.

The following ten species previously known from the Gulf of Mexico or the Caribbean are shown to occur on the Carolina coast: Dardanus venosus, Paguristes lymani, P.

triangulatus, Paguristopsis hummi, Pagurus defensus, P. impressus, Octopagurus pygmaeus, Pylopagurus discoidalis, Spiropagurus dispar, and Tomopaguroopsis problematica.

The fauna of the area studied constitutes a more or less complete unit, the majority of species not being found beyond its limits. The affinities at the species level are mainly with the Pacific coast fauna. At the generic level there is some affinity with the Indo-Malayayan fauna. In the western North Atlantic the number of species found beyond the shelf is approximately equal to the number found on the shelf.

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PLATE I

All lines indicate 5.0 mm.

Figure 1. Anterior head appendages and carapace of Pylo-
cheles inarmatus.

Figure 2. Right chela and part of carpus of P. inarmatus.

Figure 3. Median posterior part of abdomen of P. inarmatus.

PLATE 1

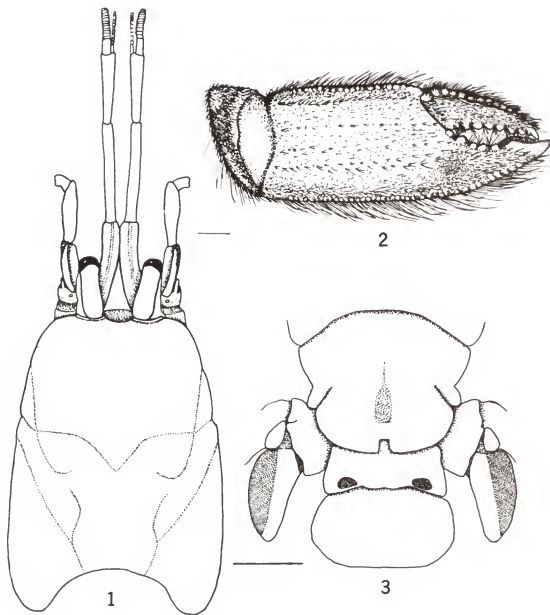


PLATE II

First gonopod of Paguristonsis hummi and 14 species of Paguristes. All from right side except No. 1. Lines indicate length of 0.5 mm.

- Figure 1. Paguristes foresti.
- Figure 2. Paguristes spinipes.
- Figure 3. Paguristes tortusae.
- Figure 4. Paguristes hewatti.
- Figure 5. Paguristes triangulatus.
- Figure 6. Paguristonsis hummi.
- Figure 7. Paguristes gravi.
- Figure 8. Paguristes puncticeps.
- Figure 9. Paguristes sericeus.
- Figure 10. Paguristes sayi.
- Figure 11. Paguristes lymani.
- Figure 12. Paguristes moorei.
- Figure 13. Paguristes depressus.
- Figure 14. Paguristes anomalus.
- Figure 15. Paguristes acuticornis.

PLATE 2



PLATE III

Second gonopod of Paguristopsis hummi and 14 species of Paguristes. All from right side except No. 9. Lines indicate length of 0.5 mm.

- Figure 1. Paguristopsis hummi.
- Figure 2. Paguristes triangulatus.
- Figure 3. Paguristes sayi.
- Figure 4. Paguristes spinipes.
- Figure 5. Paguristes moorei.
- Figure 6. Paguristes hewatti.
- Figure 7. Paguristes tortugas.
- Figure 8. Paguristes anomalus.
- Figure 9. Paguristes foresti.
- Figure 10. Paguristes lymani.
- Figure 11. Paguristes acuticornis.
- Figure 12. Paguristes sericeus.
- Figure 13. Paguristes puncticeps.
- Figure 14. Paguristes grayi.
- Figure 15. Paguristes depressus.

PLATE 3

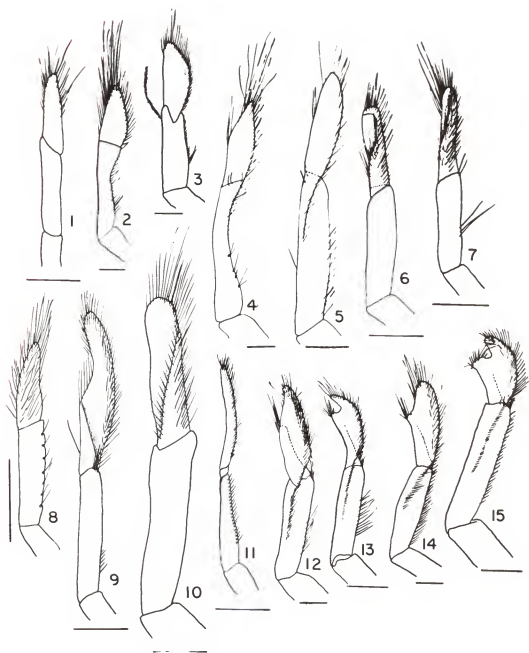


PLATE IV

All lines indicate 2.0 mm.

- Figure 1. Right carpus and chela of P. hewatti.
- Figure 2. Anterior head appendages and shield of Pagurus schmitti.
- Figure 3. Right chela of P. schmitti.
- Figure 4. Anterior head appendages and shield of Cerato-
pagurus cubensis.
- Figure 5. Anterior head appendages and shield of Pagurus
tenuidactylus.

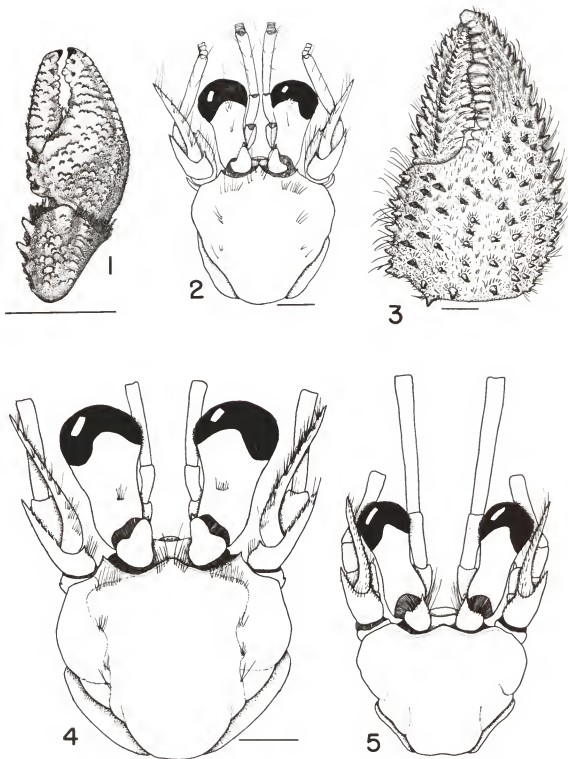


PLATE V

All lines indicate 1.0 mm.

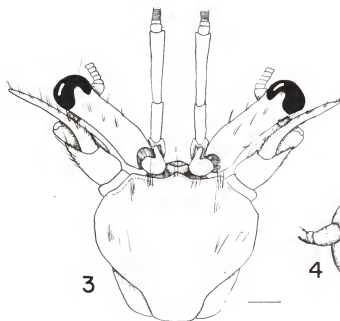
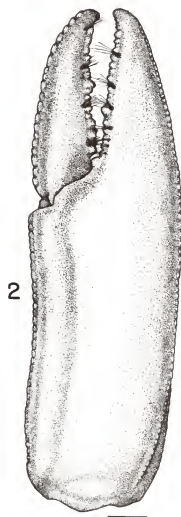
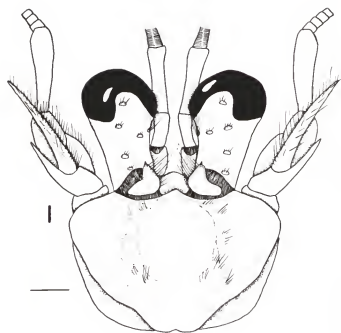
Figure 1. Anterior head appendages and shield of Pagurus longimanus.

Figure 2. Right chela of Pagurus longimanus.

Figure 3. Anterior head appendages and shield of Cestopagurus lineatus.

Figure 4. Ventral view of abdomen of C. lineatus showing protruding vas deferens.

PLATE 5



BIOGRAPHICAL SKETCH

Marvin L. Wass was born April 24, 1922, in Worthington, Minnesota. He attended high school at Pequot Lakes, Minnesota. From September, 1942, to December, 1945, he served with the Army Air Corps in the United States and North Africa.

He received the Bachelor of Science degree from Winona State Teacher's College, Winona, Minnesota, in 1949, and the Master of Science degree in Zoology from The Florida State University in 1953. From June, 1953, to May, 1955, he worked for the Pinellas County Park Board as Curator of the Mullet Key Marine Museum, Pass-a-Grille Beach, Florida.

His research interests have been in carcinology and ornithology. His principal published work was on the decapod Crustacea of Alligator Harbor and adjacent regions of northwest Florida. He is a member of Sigma Xi.

He was married to Lorna Kathryn Cowle in 1955. They have two children, Gerald and Teresa.

This dissertation was prepared under the direction of the chairman of the candidate's supervisory committee and has been approved by all members of the committee. It was submitted to the Dean of the College of Arts and Sciences and to the Graduate Council and was approved as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

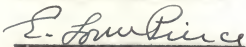
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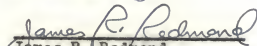
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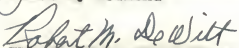
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